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AN EVALUATION OF RESEARCH ON GRADATION IN THE FIELD OF ARITHMETIC

J. T. JOHNSON
Chicago Teachers College

Editor's Note: The proper grade placement of curriculum material is an important factor in learning. The author finds that readjustment of the curriculum in harmony with recommendations of the committee of seven brought increased efficiency.

ONE of the moot questions which research is trying to answer at the present time is where shall the various facts and skills of arithmetic be taught for effective learning and retention. This is the question to which the Committee of Seven has been trying to find an answer. This committee, under the chairmanship of Carleton Washburne is in its eighteenth year of experimentation. Educators in the field of elementary education are more or less acquainted with the findings and recommendations of this committee concerning the grade placement of arithmetic topics. The writer will not relate the details of this experiment here as it is too well known. The following quotation sets forth its findings and recommendations.

"The results show, in general, (1) that there is a definite mental level below which the attempt to teach any given process is usually futile; (2) that there is a degree of mastery of the prerequisite elements of a process without which that process cannot be efficiently learned; and (3) that if a child has reached a specific mental level and a specified skill in prerequisite topics, he is reasonably sure to learn the new topic adequately and to retain it well."

"The experiments of the Committee of Seven indicate very clearly the need for taking into serious account the mental level and the arithmetical foundations of each child before attempting to teach him any given arithmetic topic. Not to do so is to doom many children to failure; to do so adequately is to insure reasonable success to the large majority of the children."[1]

[1] Washburne, Carlton W. *The Grade Placement of Arithmetic Topics; A Committee of Seven Investigation,* The Twenty-ninth Yearbook of the National Society for Study of Education (Bloomington, Illinois: Public School Publishing Company, 1930), pp. 643, 669.

The writer has followed with much interest all of the reports, discussions and criticisms of the experiment by the Committee of Seven. It was not until he read the following that he became aware of the fact that he had at that time available data which was very relevant material for implementation of the findings of that Committee.

"Research with regard to the total effect of a curriculum based on the Committee of Seven recommendations versus a curriculum organized along traditional and subjective lines is much needed. It cannot well be carried out until enough schools have used the Committee of Seven recommendations for a period of years to make such an evaluation meaningful. Certainly research is completely lacking to indicate that any harm is done by waiting until children have reached the degree of development as indicated by foundations tests and mental ages, which enable them to attack a problem with efficiency and success."[2]

In a recent publication Washburne says, "The general sequence and approximate placements as a whole, however, are thoroughly workable in a public school system and produce, according to the teachers who have used them, gratifying results. Actual research data as to the total results of such placements in comparison with the traditional placements are entirely lacking and should certainly be obtained."[3]

After all, why spend so much time and energy in arguing about whether the technique used by the Committee of Seven was of the proper kind or the teaching was of this or that kind. Why not try out a curriculum based upon the Committee recommendations under the usual method used in the common run of schools and see what the results are? It is like trying to decide the merits of a new car wholly by arguing about what kind of engine and what kind of tires it has. Is it not a good policy to give the car a test by driving it a few thousand miles and then checking up on how well it stood up under the test? The old saying, "The test of the pudding is in the eating," still holds.

To make clear to the reader how the Chicago situation made a ready field for the implementation of research in grade placement, the writer will go back to the fall of 1936 when he was engaged to revise the course of

[2] Washburne, C. W. "A Reply to Brownell's Critique of the Committee of Seven Experiment." XXXIX *Elementary School Journal.* (Feb., 1939). 417–430.

[3] Washburne, C. W. "Child Development and the Curriculum," *Thirty-Eighth Yearbook,* National Society for Study of Education (Bloomington, Illinois: Public School Publishing Company, 1939), Part I, p. 316, 1939.

study in arithmetic in Chicago. The revision was to be upward. The writer had for a number of years been working at an analysis of the fundamental skills of arithmetic. This analysis offered a very great help at this time. Besides the 390 basic arithmetic facts, there are some 60 fundamental skills to be mastered. These major skills have now been analysed and differentiated so that each skill constitutes a task of sufficient scope and unity to make it desirable for teaching in one unit. Several recent revisions have been made on the basis of try-outs in the schools of Chicago. Some skills were modified and restricted in the light of these try-outs; others were expanded.

To give the reader a better appreciation of the nature of these major skills, Table I, following, lists the major skills in addition with examples. The skills are distributed among the various arithmetic processes as follows: Addition—9; Subtraction—10; Multiplication—8; Division—10; Common Fractions—10; Decimals—6; Percentage—7. Lack of space prevents including names and examples of all the skills.

The name skill has been used above rather than ability for the reason that it is commonly used by various writers on arithmetic. They could be called abilities which, of course, they are. But we generally think of the word, ability, as a broader term. Addition may be considered as an ability or even mathematics can be thought of as an ability. We often say, he has no ability in mathematics.

Because the word, skill, has another connotation, viz., accuracy and speed, it is not the best word to use, but for want of a better term and because most school people know its meaning it is used here in the above described sense.

After an examination of the 1936 course of study in Chicago as well as many others in the larger cities and states in light of the aforementioned analysis, the following rather startling information was revealed. At the end of the third grade in these courses of study the following requirement was found:

All of the 100 addition facts, all of the 100 subtraction facts, 89 of the 100 multiplication facts and 79 of the 90 division facts were listed. Besides this the pupil was asked to learn 6 of the 9 skills in addition, 4 of the 10 skills in subtraction, 4 of the 8 skills in multiplication and 5 of the 10 skills in division. Added to this was the requirement in measurement

TABLE I

THE MAJOR SKILLS IN ADDITION OF WHOLE NUMBERS

A1. Adding a seen number to an unseen number, no sum above 10.

3	24	15	cents
2	43	23	cents
4	31	32	cents

A2. Addition with zeros, no sum above 10.

5	0	30	30	cents
0	6	43	20	cents
3	2	15	25	cents

A3. Column addition with bridging, sums limited to 18.

72	23	$3.64
03	34	5.22
64	62	4.03

A4. Addition introducing one-place carrying, limited to 3 addends and 3 columns

		36	25			534	$3.22
67	28	42	62	724	$7.63	321	5.75
36	92	15	27	269	8.55	117	2.10

A5. Higher decade addition without bridging in higher decade, limited same as in No. 4

7	67	576	$4.13
8	46	540	7.06
4	55	873	5.71

A6. Higher decade addition with bridging in higher decade, limited same as in No. 5

9	98	64	$7.62
7	54	97	6.05
5	83	76	8.29

A7. Addition with two successive cases of carrying, limited to 4 addends, 3 columns.

		385
	$6.98	588
378	8.67	109
697	7.46	468

A8. Addition with irregular left margin, limited to 5 addends, 5 columns.

27	18	$ 12.06
139	634	.35
895	4	4.20
1205	14341	139.97
6	1810	.09

A9. Long column addition, limited to 12 addends.

				4
			1	7
		2	2	6
	5	4	4	3
4	9	7	7	8
9	6	6	5	5
6	8	9	3	9
3	3	3	6	2
8	7	8	9	4
7	4	5	8	5

(taken from the 1936 Chicago course of study and typical of many others) that he learn how to use the following measures: pint, quart, and gallon; minute, hour, day, week; inch, foot, yard; cent, nickel, dime, quarter, half-dollar, dollar; pound and ounce.

This represents a total of 368 of the 390 basic facts and 19 of the 37 skills in the four fundamental operations. We are led to ask the question, Why should the 8 and 9 year old child in the third grade just learning to read English be asked to master over 94% of all the number facts and also learn over one-half of all the skills in the fundamental operations of addition, subtraction, multiplication and division, not to mention the 18 units of measure in denominate numbers?

This would seem to call for a revision on but an *a priori* examination. Hence, when the Superintendent recommended an upward shift in topics, especially long division and common fractions, the writer was very glad to make a more equitable distribution of the arithmetic requirements throughout the grades 3 to 8.

Table II represents shifts made in the new Chicago course of study together with the Committee of Seven recommendations. Those topics only are listed that were common to the Committee experiment and the course of study. Hence, all of the 60 skills are not given. The blank spaces represent places where no corresponding skills or topics were found.

An examination of the following table reveals that the new placement of skills in the Chicago Course of Study agrees quite closely with the recommendations of the Committee of Seven. Of the 45 items that are listed from both, there is agreement in 32. Seven topics are listed earlier in the Chicago course and six are listed later than in the Committee of Seven recommendations, and in all but two of these the variance is but one grade.

The revised course was inaugurated in February, 1937. It was labeled a tentative course as it was in the nature of an experiment. The writer was given the special duty of supervising the new course in operation. The interval from September, 1937, to June, 1939, a period of two school years, was spent in visiting the schools, conferring with teachers and demonstrating the new procedure in school centers. Many teachers made favorable comments from the beginning and these comments have increased in number during the past five years.

TABLE II

COMPARISONS IN GRADE PLACEMENT BETWEEN THE OLD AND NEW COURSE OF STUDY IN CHICAGO AND ALSO THE COMMITTEE OF SEVEN RECOMMENDATIONS

Formal Work	Chicago Course of Study		Committee of Seven**	
	(Old 1930)	New (1939)	Minimum	Optimum
A. Basic facts				
Addition				
Easy 55 (sums 10 and under)	2B†	2A	1	2
Dif't 45 (sums above 10)	3B	3B	2	3
Subtraction				
Easy 55 (minuends 10 and under)	2B	3B	2	3
Dif't 45 (minuends above 10)	3B	3A	3	4
Multiplication				
Easy (products 27 or less)	3B (multipliers 5 or less)	4B (products 20 or less)	3	
Dif't (products above 27)	4B (multipliers above 5	4A (products over 20)	6	
Division				
Easy (dividends 27 or less)	3B (divisors 5 and less)	4A (dividends 20 or less)	4	
Dif't (dividends above 27)	4B (divisors above 5)	5A (dividends above 20)	6	
B. Major Skills				
Fundamental Operations:				
Addition—introduced	1A+	3B, 2A*	2	4
Carrying	3B	4B		
Subtraction—introduced	2B	3B	3	3
Carrying	3B	4B		
Multiplication—introduced				
Two-place	4A	5B	4	5
Division—introduced	3B	4A	5	6
Two-place	4A	5B	5	6
Zeros in quotient	4A	5A, 6B*	6	6
Non-apparent	5B	6B, 6A*	6	7
Common Fractions				
Meaning				
Fractions of a whole (as $\frac{1}{2}$ of whole)	2B	2B		
(as $\frac{3}{4}$ of a whole)		2A	4	
Fractions of a group (as $\frac{1}{5}$ of 10)	2B	4B		
(as $\frac{3}{4}$ of 20)		5B (3 is what part of 9)	6	
Addition				
Like denominators	5B	5A	4	5
Unlike denominators	5B	7B	7	7+
Subtraction				
Like denominators	5B	5A	4	5
Unlike denominators	5B	7B	7	7+
Multiplication—introduced	5B	6B	6	
Mixed Numbers	5A	6A		
Division—introduced	5B	6B	6	
Mixed Numbers	6B	6A		8
Decimals				
Meaning	6B	5B	5	6
Addition	6B	5A	5	6
Subtraction	6B	5A	5	6
Multiplication (decimals by decimals)	6B	6B	5	6
Division—by whole numbers	6B	6A	5	6
Division—by decimals	6B	7A		7
Percentage:				
Case I	6A	7B	6	7
Case II	6A	7A	7	7

TABLE II—Continued

COMPARISONS IN GRADE PLACEMENT BETWEEN THE OLD AND NEW COURSE OF STUDY IN CHICAGO AND ALSO THE COMMITTEE OF SEVEN RECOMMENDATIONS

Formal Work	Chicago Course of Study		Committee of Seven**	
	(Old 1930)	New (1939)	Minimum	Optimum
C. Activities				
Measurements:				
Space				
Length				
Recognition of an object as 2, 3, 4x as high or wide as another			2	
Inches in 2 feet		3A	3	
Inches and feet in a yard		5+	4	
Perimeter in whole numbers (rectangles)	5A	6B	5	
Areas	4A	6B 6A*	6	
Volume	5A	8B	8	
Time				
Telling time to even hour.		2B	2	
Telling time to ½ and ¼ hour	3B	3B	3	
Elapsed days within month, and Days and weeks in year		5B	4	
Telling time to the minute		5A	5	
Elapsed days from one month to next or hours and minutes from A. M. to P. M.	5B	5A	6	

* Reshift in the second revision.

† B and A refer to the 1st and 2nd semester respectively.

** Adapted from "Adjusting the School to the Child"—Washburne, World Book Co., 1932, Table 4, p. 47 and Thirty Eighth Year Book, N.S.S.E., 1939, Part I, Chapt. XVI, pp. 309-316.

In the spring of 1938 the writer was asked to devise an arithmetic survey test for the Chicago Schools in line with the survey test which was being constructed in Reading by Dr. Englehart. The analysis of the arithmetic field into facts, skills and activities which had now been completed, tested in the schools and revised several times, made it quite easy to construct such a test which covered all the skills and many activities in the field. This test by its very nature was diagnostic because each item of the test was made to cover one skill or application. Furthermore the three forms of the tests were made equivalent in difficulty because the corresponding items in the three forms were made up of not only the same skill but the very same variety of the same skill. This may be made a little clearer from the examination of a page taken from Form 3 of the B test for the 5th and 6th grades. Table III following is a copy of the division test of B3.

TABLE III

THE DIVISION TEST FROM THE CHICAGO ARITHMETIC SURVEY TEST, B-3, SHOWING EXAMPLES FROM NINE OF THE DIVISION SKILLS

Divide:

(1) D–3	(2) D–4	(3) D–6
5) 375	6) 420	63) 379
(4) D–7	(5) D–8	(6) D–9
6) 4824	73) 3285	84) 3377
(7) D–10	(8) D–11	(9) D–c
78) 6716	16) 1268	432) 26799

The letters and numbers above after each item such as, D–3, D–4, etc., designate the skill numbers. These are all explained in detail in the manual which accompanies the tests. Thus D–3 above is the third skill in division and it embodies uneven division by divisors 5 or less with no remainder in quotient, D–4, example (2) above illustrates the fourth skill in division which is division by divisors 6 or less with final zero in a two-place quotient.

(3) D–6 represents the 6th skill which is first two-place divisor, one-place quotient.
(4) D–7 represents the 7th skill with middle zero in quotient.
(5) D–8, two-place divisor, two-place quotient, apparent quotient figures.
(6) D–9, two-place divisor and quotient with final zero in quotient and remainder.
(7) D–10, two-place divisor and quotient, non-apparent quotient figures.
(8) D–11, the "teen" divisors.
(9) D–c is not a new skill but a composite example representing division complete.

When the results of these tests were checked up it was possible not only to make up city wide norms fulfilling the survey purpose of the test but also to ascertain which of the skills were being learned and which ones offered the greatest difficulty at the grade where they were placed. This gave us a check on relative difficulty of the skills involved but more important than that it gave us an invaluable aid not to say indispensable for checking on the grade placement which was used in the tentative course.

On the basis of the first returns from the test results a revision of the course was made in June, 1939. This is shown by means of asterisks in Table II as far only as the topics thus listed were affected.

The new course has now been in operation about four years. During that time three different forms of the survey test in arithmetic have been

given; the first in the fall of 1938, the second in the spring of 1939, and the third in the spring of 1940. The number of pupils taking this city wide test in grades 3B to 8A was 25,000, 30,000, and 20,000 respectively. Schools from different communities were selected to give random samplings.

The city norms from these three survey tests were computed. They show an increase in efficiency from year to year. This is shown in Table IV.

These gains in city norms in so short a time are offered here as evidence of better learning or better retention of learning or both. The average gain in improvement throughout the grades 3B to 8A during the two year period was over 21.2 per cent based on the accomplishment in September, 1938.

The results obtained on the first survey test may be considered as the accomplishment of the control group, who had used the traditional curriculum for a number of years. The result of the third or last survey test may be considered as the result of the experimental group after using the new curriculum for two years. The mental ability of the children was about the same; the personnel of the teachers was about the same; the time of teaching was less in the experimental group because no time allotment for arithmetic was given in the first and second grades under the new curriculum.

The lesser gain of 13.6% which is the average of 18.5, 10.03, 17.5, 8.3, made in grades five and six than the gain of 24.4% the average in grades three and four and 25.4% in grades seven and eight, as shown in Table IV, would indicate that the work in grades five and six is more difficult for pupils of that level than the work in grades three, four, seven and eight is for pupils of those levels. This may be due to one or more of the following conditions: that the work was intrinsically more difficult, or that the 5th and 6th grade child, due to some biological or physical condition of growth cannot learn and retain as much per length of time as the child of the earlier or later grades, or it may be that the tests in grades 5 and 6 were intrinsically more difficult. This should be checked by further experimentation. Table IV would indicate also that more of the early formal work may be done in the second grade.

It should be understood that no sacrifice of topics was made in the seventh and eighth grades. The difficult parts of common fractions and decimals were moved up to the seventh grade, and a unit on mathematical appreciation was added in the eighth grade.

TABLE IV

INCREASE IN NORMS, MEDIANS, AS REVEALED BY SUCCESSIVE TEST SCORES

Date	Number of Tests	Test A 3B	3A	4B	4A	Test B 5B	5A	6B	6A	Test C 7B	7A	8B	8A	Average Per Cent Gain
September, 1938	25, 000	10. 3	15. 1	23. 1	25. 4	20. 0	26. 3	29. 1	35. 1	11. 7	14. 3	15. 5	18. 8	
June, 1939	30, 000	10. 6	17. 9	25. 4	33. 4	21. 1	27. 9	33. 0	37. 5	13. 9	16. 5	18. 6	21. 6	
June, 1940	20, 000	12. 5	19. 0	26. 5	34. 5	23. 7	29. 0	34. 2	38. 0	15. 3	17. 6	20. 0	22. 4	
Per Cent Gain—September, 1938–June, 1940		21. 3	25. 8	14. 7	35. 8	18. 5	10. 3	17. 5	8. 3	30. 7	23. 0	29. 0	19. 1	
Average Per Cent Gain by Groups		Grades 3 & 4, 24. 4				Grades 5 & 6, 13. 6				Grades 7 & 8, 25. 4				21. 2

As a check against the content of the seventh and eighth grade survey tests which were given to cover the whole area of the arithmetic field, the same test was given to the 320 entering Freshman of the Chicago Teachers College in September, 1939. The median raw score for the College students was 23.3. For the same tests taken by the 8A pupils in the third city wide test, mentioned above, the median raw score was 22.4.

It should be added here that the author is well aware that besides facts and skills in arithmetic there are activities and social problems which are of major importance. These are included in the Chicago course of study but they were not included in this study for two reasons; first, there were no definite data on grade placement of activities and problem solving when this study began in 1938. The Committee of Seven is now engaged in an investigation in this field. Their findings in the activity of measurement reported in 1939 have been utilized as far as common elements with the Chicago course of study permitted. Secondly, there are no definitely devised standardized tests as yet on the activities of measurement and construction and social problem solving.

There is need for two experiments in the future each on a large scale in the grade placement area. The first concerns the grade placement of the various skills or sub-topics in a large operation. To illustrate, under the term Meaning of Fractions, there are four distinct stages in order of difficulty as follows: Unit fractions of a whole, as $\frac{1}{2}$ of 1 apple: Multiple fractions of a whole, as $\frac{3}{4}$ of a pie; Unit fractions of a group, as 1/3 of 12; and Multiple fractions of a group, as 2/3 of 27. These are all of different difficulty and cover a range of 3 years in presentation in the Chicago course of study (3B to 5B). They are not all represented in the Committee experiment. The second has to do with the grade placement of various social arithmetic problems.

Anent this, Dr. Brueckner says: "The results of these investigations make it clear that in any process—in long division, for instance—there is a wide range in the difficulty of the various kinds of examples constituting the whole process. This suggests that we should probably not speak of the optimal mental level at which an entire process, such as long division, can best be taught. It may be better to consider the possibility of breaking a major process into elements, groups of which may be taught at different levels of development."[5]

[5] C. W. Washburne, The Thirty Eighth Year Book of the N.S.S.E., Part I, p. 289.

Mr. Washburne in the same volume says this : "The Committee of Seven feels that its tests are subject to two clear limitations. In the first place, they are of the formal arithmetic test type; that is, they evaluate the child's knowledge by his ability to perform in the abstract the operation he has been taught. They do not usually evaluate the child's concepts, his realization of function, or his experiential understanding of the work. In the second place, the tests in a number of cases evaluate only the completion of the topic and fail to indicate at what levels the easier aspects of the topic can be effectively learned."[6]

"The Committee has found, for example, that teaching column addition three digits wide and three digits high comes a year earlier than teaching column addition three digits wide and four digits high. If all processes were broken up in this way, what would be the levels of the various sub-topics?"[7]

"What are children's needs at various levels of development and how far should these affect the curriculum? Thus far the Committee's studies have dealt merely with the level where we can effectively teach a topic and have sought no clue as to the social situations in and out of school that might make that topic necessary and useful to the child."[7]

The ground work is already laid for a large scale experiment on grade placement of the various component skills in a topic for we have all of the arithmetic skills pretty well analyzed. The grade placement of activities and social problems will need much further analysis and investigation in methods of teaching and organization before we can attack such a problem scientifically.

We should not lose sight of the fact that in the Committee of Seven studies recommended placements were made on the basis of mental ages rather than grades. Since each grade presents a range of about 5 years, when grades are quoted as they are in the tables, the grade is understood to be the grade whose average mental age corresponds to the mental ages in the recommendations. This also explains why it was possible in the past to teach arithmetic to pupils about a year below that in which it should be taught. For example, if we say that in a fifth grade the mental ages range through 9, 10, 11, 12, 13 years, the average being 11 years, our teaching has been suited only to the two upper groups. This would mean about 30 per cent of the class if the five-group distribution corresponds to the normal distribution of 7—23—40—23—7%. It was too difficult for about 70 per cent of the class. Now by moving up requirements about a

[6] Ibid., p. 319.
[7] Ibid., p. 322.

year we include the middle group, the 11-year olds mentally, and thus provide for good teaching to 40 per cent more or 70 per cent of the class. There is still a group of about 23 per cent to whom the work will be rather difficult and a group of about 7 per cent to whom the work is perhaps too difficult. This calls for some provision in the teaching method that recognizes individual differences which will always exist between the members of any grade.

In conclusion may it be said that despite the recognized limitations in the experiment of the Committee of Seven, the total effect of readjusting a course of study in accordance with the Committee of Seven recommendations is a substantial gain in arithmetic efficiency, resulting in the curriculum fitting about 70 per cent of the children to the work instead of about 30 per cent.

This article has been written in the interests of making the organization of the curriculum and as a consequence the teaching of arithmetic more scientific. Let us (1) analyse the field to see what there actually is to teach, (2) analyse the subjects to whom it is to be taught, and (3) try to fit the two together so that there will be less misplacement, fewer misfits, and less misery in the teaching and learning of arithmetic.

A SURVEY OF ATHLETIC PARTICIPATION AND SCHOLASTIC ACHIEVEMENT

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Editor's note: The author presents a survey of studies relating to the participation in athletic and scholastic achievement. While the results seem inconclusive something might be said for exercise as a means to physical fitness.

BOTH educators and laymen have for many years debated the influence of athletic participation upon scholastic achievement. In an attempt to settle the argument, many studies have been carried on at both the high school and college level. The following report does not presume to decide this issue, but merely to review and comment upon various studies which have been made.

In order to get a complete picture of athletic participation and scholarship, this study approaches the question from three angles, namely: a survey of the literature in relation to interscholastic athletes and their scholastic achievement, a similar survey pertaining to intercollegiate athletes, and a review of the literature dealing with intra-mural participants and their scholastic achievement.

Interscholastic Athletes and Their Scholastic Achievement. In a review of the literature, prior to 1930, Jacobsen (1) summarized the results of these studies on the basis of the number of studies which found a positive relationship, no relationship, and a negative relationship between scholarship and athletic participation. He reported that ten investigators found that the scholarship of athletes either improved during participation, was better than that of non-athletes, or both. Four investigators found that participation had no visible effect, and three found participation to have a detrimental effect. These investigations covered the period roughly from 1900 to 1930. Jacobsen, however, criticized these early investigations since there were no control groups and the data was not treated statistically.

A somewhat later study by Eaton and Shannon (2) reported upon the subsequent college careers of high-school athletes and non-athletes at Indiana State Teachers College. As measured by marks in college, non-athletes were significantly superior to the high-school athletes in scholarship.

Cook and Thompson (3), in comparing 91 letter winners with 100 non-letter winners in the Hughes High School, Cincinnati, concluded that

athletes were slightly lower in scholarship, and made poorer records during periods of competition; were more likely to graduate, more likely to go to college; and remained in school longer than non-athletes.

Finch (4), at the University High School of the University of Minnesota, paired athletes with non-athletes on the basis of I.Q. scores. Achievement was measured by teachers' marks. The result of this study showed no significant difference between the groups.

Cormany (5) carried on a study in five West Virginia high schools, administering the Otis Test of Mental Ability to athletes and non-athletes. The subjects were paired on the basis of age, grade, and I.Q. Achievement was measured by standardized tests. There was no significant difference between the two, the trend, however, was slightly in favor of the athletes. The I.Q. of both groups was about the same.

In a study covering a three-year period at the Washington High School, Indianapolis, Jones (6) compared the intelligence of 493 non-athletes with that of 80 athletes. Utilizing the Illinois General Intelligence Scale, he concluded that high-school athletes are more intelligent than non-athletes. A smaller percentage of non-athletes scored less than ninety, a larger percentage of the group in the range from 90 to 120 were athletes, and the very superior group above 120 was equally divided.

In 1936, Reals and Reess (7) carried on a rather comprehensive study of high-school letter men, their intelligence and their scholarship. Eight hundred eighty-eight subjects, of which 176 were letter men, were studied. Each athlete was paired with a non-athlete on the basis of chronologic age and I.Q. The mean I.Q. of the 888 was 108.2, while the mean I.Q. of the athletes was 106.4. They also found in the sports group, that the I.Q. of track athletes was superior, while those in baseball exhibited the lowest IQ. This difference was statistically significant. In relation to the scholarship of athletes and non-athletes, the participants were slightly superior, but the results were not statistically significant. On the basis of the Sones–Harry High-School Achievement Test, the non-athlete group ranked higher than the athletes and the difference was significant. This might indicate that the subjective judgment of teachers in giving grades is influenced somewhat by athletic participation.

Intercollegiate Athletes and Their Scholastic Achievement. The Carnegie Foundation (8), in its report on college athletics, gives rather a detailed summary of studies which have been made on the relationship of

intercollegiate athletics to scholastic attainment. The following studies were included in their report:

At Harvard in 1921, 1600 upper classmen, of whom 348 were athletic participants were studied, and although the athletes were not quite up to average in scholarship, they nevertheless made a reasonably good showing.

McCracken, in a study of team captains at 47 colleges, found them to be above average in scholarship.

Finlay, in 1926, combined results at McGill, Harvard, Michigan, Penn State, and Wisconsin, and found athletes' averages slightly higher than non-athletes.

Burt and Nichols at Ohio State, reported that the I.Q. of athletes was about eight per cent lower than non-athletes. This was due to a smaller number of high scores on the part of the athletes, rather than many low scores. Cross-country, tennis, golf, and track athletes were similar to the all-university average; however, participants in baseball, football, basketball, and wrestling were lower.

In 1925, a study of 68 athletes and 337 non-athletes at Columbia University showed the athletes to be of the same intelligence as the non-athletes; however, the former fell slightly behind in scholarship, carried a lighter schedule, and remained in college longer than the latter.

A later Harvard study, 1928, of 301 athletes and 505 non-athletes, found the non-athlete making slightly higher marks than the athlete, however, more athletes graduated.

At Rutgers in 1926, it was found that athletes had a higher I.Q. and received a higher average grade than non-athletes during their four-year courses. In addition, a larger percentage of athletes received degrees. Both groups studied, carried approximately the same number of hours of work.

In reviewing studies at 44 institutions, the Carnegie Foundation stated that the academic averages of athletes were higher than non-athletes in some institutions and lower in others.

Cooper (9), in 1933, using objective tests to measure scholastic achievement, reported in a study covering seven Pennsylvania colleges, that athletes are not poorer students than non-athletes.

A more recent study of letter winners at the University of Iowa by Tuttle and Beebe (10), covering a five-year period from 1935 to 1940, gives interesting results. This study involved 577 athletes and gave the following results:

The scholastic attainments of letter winners as based upon the grade point averages were approximately equal to the averages of the male group to which they belonged. The correlation between the University of Iowa Qualifying and Placement Examination Percentile Rank and the grade point averages, was approximately 0.8. The athlete participating in the sports upon which most emphasis was placed, ranked lowest scholastically. In all sports, scholastic averages moved down during the season of competition. The data indicated that scholarship and athletic success are directly related, as shown by the fact that generally the attainments of letter winners during championship years either were the highest, or well above the group for the period studied.

Intramural Participants and Their Scholastic Achievement. Hackensmith and Miller (11) made a comparison of the academic grades and intelligence scores of participants and non-participants in intramural athletics at the University of Kentucky for the 1935–36 school year. Three hundred twenty-two students, of which 161 were participants, were used in this study. The two groups were divided in such a way that an equal number of students was used in each class—48 freshmen, 41 sophomores, 38 juniors, and 34 seniors. The 161 participants engaged in an average of six different activities, including team sports.

The results of the study indicated that freshman participation in intramural athletics does not have a marked effect upon the student's academic grade, that participants in intra-mural athletics as a whole, have a higher mean intelligence sigma ranking than those who do not participate, that sophomore participants show a slightly higher mean academic grade; and that junior and senior intramural participants demonstrate a definitely higher mean academic grade than do non-participants of the same class.

Mitchell (12) has stated that the experience of the University of Michigan would indicate a correlation between intramural participation and scholastic attainment, by the fact that for many years there has been a close correlation between the relative ranking of the fifty or more fraternities on the basis of their high scholastic standing, and the top places in the intramural scoring system. With a very few exceptions, the high ten intramural groups have been listed with the high twenty scholastic groups.

Washke (13), at the University of Oregon, carried on a five-year study of 271 students who had competed in five to eight activities. A control group of 271 non-participants was used, so that each participant could be paired

with a non-participant on the basis of age, class standing, major subject, score on psychological entrance examination, and the student's quartile standing in his high school graduating class. He found that the intramural participants showed a slightly higher grade point average over the non-participants in all but one year. As compared with the all men group of the university, the intramural participants received a grade point index higher than the non-participants in three of the five years. Seemingly, the intramural program as it was functioning at the University of Oregon, had no deleterious effect on participants' scholastic attainment.

In a study of intramural participation at the University of Wichita (14), maximum, moderate, and non-participants were examined in relation to their grade point index, number of extra-curricular activities (not including intramurals), and the hours employment per week. Out of 120 subjects, 40 in each group were considered. The study was carried on during the 1940–41 school year, and only those students carrying twelve or more hours of academic work were included. The maximum participant group consisted of those who engaged in 20 or more intramural contests during the year, and the moderate participants engaged in from 10 to 20 contests. Scholarship was measured on the basis of grade point averages, and the following results were obtained:

The moderate and maximum participant groups showed a higher grade point average than the non-participants, although the results were not statistically significant. The maximum participants showed a slightly higher grade point average than the moderate participants, although here again, the difference was not significant.

In relation to the number of extra curricular activities engaged in, the moderate participant and the maximum participant groups each showed a significantly greater number of extra-curricular activities than the non-participants. The maximum participants engaged in more extra-curricular activities than the moderate participants, but the difference between the two was not significant.

As to hours employment per week, there was no significant difference between the three groups, although on the basis of mass averages, the non-participants worked the most, the moderate participants slighlty less, and the maximum participants still less.

Such results would indicate that outside work may slightly reduce the extent of intramural participation, but participation in extra-curricular activ-

ities and scholastic success seem to parallel the degree of intramural participation—at least at the University of Wichita.

Conclusion. The general trend of the studies reviewed would seem to indicate that neither interscholastic nor intercollegiate athletics have a deleterious influence upon scholastic attainment. There are a few points, however, to be kept in mind before drawing unwarranted conclusions.

In considering interscholastic and intercollegiate athletes, it must be remembered that a select group in which many failures are automatically excluded, is being compared with a general group in which all failures are included; as is emphasized in Tuttle and Beebe's (10) study. This, of course, would tend to favor the grade point averages of the athlete.

Also in some institutions there is a chance that pressure groups may operate in favor of the athlete, and although this would not influence the higher grade level, it might reduce the number of failures. In addition, college athletes carry fewer hours, generally speaking, and should as a result, do slightly better work.

On the other hand, there are two factors which seem to counterbalance the above. As the University of Iowa study pointed out, the grades of athletes tend to drop during the season of sport and are lower in those sports where greater emphasis is placed. Some colleges also, may encourage those athletes of inferior intelligence to enter their institutions, who might not have gained entrance otherwise.

Intramural participation seems to offer no opposition to scholastic attainment. In fact, studies herein outlined seem to indicate that the high quality students are those who engage quite extensively in intramurals.

Since it is difficult to demonstrate that time spent in athletic participation is detrimental to scholarship, and since it is becoming increasingly evident that good health and physical fitness is a worthy goal in itself more time could well be spent on conditioning activities in both our high schools and colleges. This emphasis would seem important in the present emergency where physical fitness counts for so much. Physiologists would agree that the two hour a week allotment, which most schools give to the physical education program, will do little to toughen up a man for military service. At least one to two hours each day of heavy physical activity should be a minimum for those physically capable, and in the light of the above study, such a program need not interfere with scholastic attainment.

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MOTOR PERFORMANCE AS A CHANCE FACTOR[1] IN TEST SCORES

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Editor's note: Performance is the product of many factors. In the refinement of tests many controls have been introduced. The author studies the motor factor in rate tests in certain school subjects.

WORKERS attempting to measure performance in educational subjects, such as arithmetic, and teachers seeking to interpret the results of such measurement, continually ponder the validity of the tests. Although some teachers might indignantly deny that they ever had a speaking acquaintance with a concept like validity, no good teacher would fail to insist on knowing what the test results of her pupils mean.

The factor of motor performance has long been eyed with particular suspicion by the test-makers. They have felt that this factor, more than any other, is capable of altering test results in an uncontrolled manner, and so affecting reliability and validity. Hence they have placed much emphasis on the control of this factor.

However, we still face an important question. When every conceivable effort has been made to reduce extrinsic motor performance to a minimum, is it then permissible to relegate the possible remaining modicum of motor work to the broad category of chance variation, and to control it by mere statistical devices for calibrating error?

What is usually called "chance" is here regarded, not as a matrix of random "breaks" that forever will befog test results, but merely as a complex of uncontrolled factors in a situation. Then "chance" ought to diminish proportionately as these factors are located and brought under control. Ideally, control of all factors would mean total disappearance of chance, and consequently perfect testing.

If this is true, statistical measures of error become mere makeshifts, and in themselves are misleading unless so interpreted. Furthermore, such measures of error are nearly useless when individual cases are under consideration. It becomes the duty of the researcher to analyze the content of

[1] This paper is based on a Master's Thesis: "Differential Testing as a Means of Determining True Status in Arithmetic" (Ann Arbor, Michigan: University of Michigan, 1939). A similar paper was read at the Twenty-Second Educational Conference, Detroit Public Schools, Detroit, Michigan, May 16, 1940.

"chance", and to work indefatigably to bring its elements under control. If such control were easy, there would be no such thing as chance. In dealing with difficult elements, one is wise to reach for those which appear nearest at hand. Motor performance is one.

An insidious property of motor performance is that it appears to be controlled in many situations where this is not true. The present problem is dual: first, to determine whether the motor factor is under control in a "conventional" rate test in the simple arithmetical combinations; second, to investigate differential test technique to see whether it brings additional control into this situation.

BACKGROUND OF THE EXPERIMENT

There are broad and recognized differences between children in their abilities to manipulate a pencil, and a single child may vary widely from day to day or from minute to minute in the speed of his writing. Therefore, in tests where speed is a factor, great efforts have been made to decrease the amount of writing necessary—except, of course, in writing tests. Arithmetic rate tests typically present printed problems; the child has only to do the computation in his mind and write the answer. Thus motor performance is reduced to a minimum; one cannot well conceive of less pencil activity. Yet differential tests appear to demonstrate that varying motor performance still constitutes an important uncontrolled factor causing variation in test results.

Rate testing in the hundred elementary combinations of addition and multiplication offers a relatively simple field for study of the influence of the motor factor. In a typical conventional rate test in addition, for example, the subjects are presented with sheets of paper, on which are printed the hundred elementary combinations in the form shown in Figure 2. When the directions are understood, the children are told to start; and at the expiration of a given number of seconds they are stopped. The tests may be scored by

DIRECTIONS: Copy the numbers below the lines as rapidly and accurately as possible:

10	12	5	13	16	10	13	0	9	2
—	—	—	—	—	—	—	—	—	—

Figure 1.
Section of Part 1 of a differential test.

DIRECTIONS: Add the following problems, and place the sum of each problem below the line:

2	5	3	8	7	4	9	0	6	1
8	7	2	5	9	6	4	0	3	1
—	—	—	—	—	—	—	—	—	—

Figure 2.
Section of a typical conventional rate test. This figure also illustrates Part 2 of a differential test.

subtracting half the number of wrong responses from the total number right, to get a speed-accuracy correction. The resulting corrected total, compared with norms, is taken as an index of the child's ability to add at this level.

By this method, if Child A has a corrected minute-score of 13, while Child B has a corrected minute-score of 17, it is assumed that Child B is about 31 per cent better at this kind of addition than Child A.[2] For practical purposes, the respective motor performances of the children are either disregarded, or are assumed to be equal because of the minimal amount of pencil work necessary.

But suppose it were experimentally determined that Child B could write much faster than Child A? How would such a discovery affect a judgment of the respective adding abilities of the two children? Would not their mental processes be considered much more nearly alike? Would not the differences in their test results have to be regarded as largely owing to differences in writing speed, rather than to differences in speed of mental processes?

The Courtis Differential Test,[3] as used in the present experiment, differs from conventional rate tests. The present instrument has two parts: in Part 1, motor performance is tested; in Part 2, the function in question (i.e., addition or multiplication rate) is tested; thus the two scores may be compared by means of a Percentage Score which displays the relationship between the individual's adding or multiplying speed and copying speed.

To illustrate: in Part 1 of a differential addition test, the child is presented with a series of numbers like those in Figure 1, with instructions to *copy* the numbers as rapidly as possible below the lines. In Part 2 of the

[2] Actual experimental cases.
[3] Courtis, S. A., Standard Research Tests. Detroit, Michigan: Friesema Bros.

test, the child is presented with a series of problems like those in Figure 2, with instructions to *add* as rapidly and accurately as possible, and to place the sums below the lines. It will be observed that the sums in the addition problems of Part 2 are identical with the figures copied in Part 1. Thus, when equal times are allowed for the two parts, the amount of motor work done is identical (except for minor factors, such as eye motions, variations in sizes of the written figures, etc.).

It may then be assumed that the chief factor causing variation in score from Part 1 to Part 2 is the mental work, or computation, involved.[4] If now the score in Part 2 be divided by the score in Part 1, the resulting Percentage Score is intended to show how rapidly the child can add with reference to his own copying, or motor performance.

RESULTS OF THE EXPERIMENT

As previously stated, the present experiment was intended, first, to determine whether the suggestions given above, as to the lack of motor performance control in a rate test, have a basis in fact, and second, to put to proof the actual operation of the differential tests in imposing additional control.

Essentially the experiment consisted of administering a series of 14 differential tests in the simple addition combinations, and a series of 14 differential tests in the simple multiplication combinations, to a group of 60 sixth grade pupils in a Detroit school.[5] One addition and one multiplication test were administered to each subject on each day. During the first week, five addition and five multiplication tests were given, to arrive at measures of initial status before training. During four intermediate weeks, practice was undertaken on the first four days of each week, and the subjects were tested on the fifth day. In the last week, each type of test was administered five times to each subject, to gain measures of final status after training.

[4] That is, the chief factor, *in the instrument*, causing variation. Fluctuations in effort, which are very disturbing factors *in the examinee*, cannot here be controlled.

[5] Nineteen tests were actually administered for each operation. Five of these tests were not considered in the analysis, since they were given under varying conditions for a purpose intended for later discussion. As a matter of fact, these five tests probably gave the subjects practice, and were partly responsible for whatever improvement occurred.

The experiment was begun with 94 cases. Thirty-four were adjudged invalid and thrown out. The basis of selection was objective, and was intended to create a more representative group; it is explained fully in the writer's thesis (*op. cit.*).

The 60 subjects were divided into two groups. During the training period, Group A (30 children) practiced addition problems only, while Group M (30 children) practiced multiplication problems only. Thus, when one interprets the results in addition, Group A is experimental and Group M is the control group; conversely, when one interprets the results in multiplication, Group M is experimental, Group A control.

TABLE I

STATUSES OF GROUPS A AND M AS TO THE CRITERIA ON WHICH THEY WERE PAIRED

Group	Initial Mean Scores					
	Addition			Multiplication		
	Pt. 1	Pt. 2	Pct.	Pt. 1	Pt. 2	Pct.
A	26.5 ± .5	13.6 ± .7	51.4 ± 2.5	22.7 ± .6	11.0 ± .7	46.4 ± 1.6
M	27.0 ± .5	14.0 ± .6	51.5 ± 1.5	22.6 ± .5	10.5 ± 1.6	47.9 ± 2.3

Group	Grade (No. Cases)		Intelligence (Pct of Cases)			Age (Years and Months)		
	6B	6A	A, B	C+, C, C−	D, E	Q1	Md	Q3
A	16	14	17	53	30	11-8	11-11	12-9
M	14	16	10	53	37	11-3	11-10	12-5

Group	Social Status (No. of Cases)			Sex (No.)		Light (No. of Cases)		
	Good	Fair	Poor	M	F	Good	Fair	Poor
A	16	14	0	19	11	6	20	4
M	18	12	0	21	9	7	18	5

Criteria for establishing the two groups, A and M, included the initial tests of status, the child's intelligence,[6] grade,[7] and chronological age. Some consideration was given to social status,[8] sex (40 of the 60 were boys), and the relative amount of light[9] each child was receiving. Table I displays the

[6] Intelligence ratings based on the Detroit Group Intelligence Tests. Bloomington, Illinois: Public School Publishing Company. These had previously been administered as a matter of school routine.

[7] That is, 6B or 6A.

[8] Ratings of social status were made on a three-division scale (good–fair–poor), based on nationalities of parents, occupations of parents, and home languages.

[9] Light measured in foot-candles on three successive days in various parts of the room.

comparative statuses of the two groups as to these criteria. It will be seen that they were closely equated.[10]

To determine initial status, the results of tests II–V were averaged for each child.[11] That is, in the case of the addition tests, his four scores in Part 1 (copying) were averaged, as well as his four scores in Part 2 (computation). The Percentage Score statuses were differently found: instead of averaging the actual Percentage Scores, it seemed better to divide the child's average in Part 2 by his average in Part 1. The same procedure was followed for the multiplication tests. The initial mean scores in Table I are the means of the distributions of those averages.[12]

TABLE II

FINAL MEAN SCORES OF GROUPS A AND M

Group	Addition			Multiplication		
	Pt. 1	Pt. 2	Pct.	Pt. 1	Pt. 2	Pct.
A	32.4 ± 1.1	15.7 ± 1.1	48.3 ± 2.8	26.8 ± .4	11.8 ± 2.5	44.4 ± 2.4
M	32.3 ± 1.1	15.4 ± .9	47.0 ± 1.8	26.9 ± 1.0	14.6 ± 1.0	53.2 ± 2.4

The training period has been described. As stated, tests of final status after training were given as follows: to both groups, five tests in addition and five tests in multiplication. To gain single measures of final status, the results were averaged in the same manner as were the initial scores, except that five tests instead of four were available for each child. Table II shows the final mean scores.

Differences between the final and initial mean scores of each group are displayed in Table III, with sigmas of the differences and critical ratios. These differences were achieved by subtracting the statuses shown in Table I from those in Table II. For convenience in comparing experimental and control groups, the order of presentation has been changed.

[10] All errors shown throughout this study are sigmas.

[11] Test I was considered invalid, since it represented a new situation. The scores were uniformly low, and did not seem suitable for plotting on a growth curve.

[12] No attempt was made to get the sigmas of each child's averages.

TABLE III

DIFFERENCES BETWEEN FINAL AND INITIAL MEAN SCORES

Type of Score	Type of Test	Group	Diff. (Fin.—Init.)	C. R. (Diff. / σ diff.)†
Pt. 1	Add.	A (exp.)	5.8 ± .8	7.3
		M (con.)	5.3 ± .8	6.6
	Mult.	M (exp.)	4.1 ± .3	13.7
		A (con.)	4.3 ± .6	7.2
Pt. 2	Add.	A (exp.)	2.1 ± .6	3.5
		M (con.)	1.4 ± .4	3.5
	Mult.	M (exp.)	3.6 ± .5	7.2
		A (con.)	1.3 ± 1.4	.9
Pct.	Add.	A (exp.)	−2.6 ± 1.6	1.6 (—)
		M (con.)	−4.5 ± .8	5.6 (—)
	Mult.	M (exp.)	5.3 ± 1.4	3.7
		A (con.)	−2.0 ± 1.5	1.3 (—)

† $\sigma_{diff.} = \sqrt{\sigma_{Mx} + \sigma_{My} - 2r_{xy}\,\sigma_{Mx}\,\sigma_{My}}$

The results are further broken down in Table IV, where the significance of the differences between the changes in the experimental groups and the changes in the control groups is weighed.

TABLE IV

DIFFERENCES OF DIFFERENCES

Type of Score	Type of Test	Diff. of Diff. (Exp.—Con.)	C. R.
Pt. 1	Add.	.5 ± 1.1	.5
	Mult.	−.2 ± .7	.3 (—)
Pt. 2	Add.	.7 ± .7	1.0
	Mult.	2.3 ± 1.5	1.5
Pct.	Add.	−1.9 ± 1.8	1.1 (—)
	Mult.	7.3 ± 2.1	3.5

INTERPRETATIONS

Table IV presents a bugaboo that ought to be scotched immediately. It is clear from the critical ratios of the differences of differences that in only one case—Percentage Scores in Multiplication—did the experimental group improve in a significantly greater amount than did the control group. It is true that the ratios for Part 2 Scores are suggestive of experimental

improvement, since these ratios are much larger than those for Part 1 Scores, where no difference existed in training or practice between experimental and control groups. Yet the fact remains that the ratios are well below 3.0, and hence only one safe interpretation can be made: training did not appear to affect significantly the scores of the experimental groups in addition or multiplication computation.[13]

However, the failure of training as such does not affect the interpretation which follows with reference to the problem as it is stated in this report. We are concerned with determining whether any positive change in the results of a rate test in arithmetic, after training or practice or simply lapse of time, will hold up when the motor factor is weighed quantitatively along with that change. The picture would have been more clear-cut if the experimental groups had improved in Part 2 Scores more than did the control groups. The findings nevertheless remain as valid as they otherwise would have been. Presumably some transfer effect caused the control groups to improve in one function as a result of training in the other function. Or possibly testing in the untrained function had an inhibitory effect on the experimental groups when they were tested in the trained function.

Whatever the explanation, Table III shows that, in Part 2 Scores in addition, the significance of improvement of the experimental group was equal to the significance of improvement of the control group. Since both groups improved significantly, although in different amounts, it should be permissible to deal with both as experimental groups, and make interpretations on that basis.

A different situation is observed in the case of Part 2 Scores in multiplication. In this case, Table III shows that the experimental group improved significantly, while the control group's improvement was not significant. Different interpretations will have to be made here.

The first part of the problem is to determine whether the motor factor is under control in a conventional rate test in the simple arithmetical combinations. The assumption is now offered that if significant improvement in computing sums and writing down the answers be accompanied by significant improvement in merely copying the numbers which are written when the computation is being done, then the motor factor in the computation test is

[13] This statement differs from the interpretation made in the writer's thesis (*op. cit.*), and he considers this one more accurate.

not under control, since it is displaying significant variation. This assumption is counter to a basic assumption of a "conventional" rate test: that the motor factor does not vary significantly, and hence is under "good enough" control. The new assumption may be stated in a more specific way: if a child's writing speed improves significantly from test to test, there is no way of knowing from the arithmetical rate test whether apparent improvement results from true growth in the mental process, or merely from improvement in the motor factor.

If this assumption is accepted, it follows that, according to the results in Table III, the motor factor was not under control in the "conventional" rate test of addition used in the present experiment. Reference to the description of the differential test (see above) will show that Part 2 of the test is, in itself, a typical rate test, in which the child computes simple sums against time. Table III shows that, in Part 2 Scores in addition, both Group A and Group M improved significantly from the beginning to the end of the experiment. Typically this would be interpreted as meaning that improvement in the ability to add had actually occurred.[14] But, simultaneously, the Part 1 (copying) Scores of Group A and Group M were improving significantly.

On the basis of the new assumption, it must be concluded that, under the conditions of this experiment, motor improvement (as indicated in Part 1 Scores) was largely responsible for the apparent improvement in adding ability (as shown in Part 2 Scores). Since Part 2 resembles a typical rate test, it is generalized that the motor factor is not under "good enough" control in such a test.

Similar conditions are present in the Group M (experimental) results in multiplication. Table III shows that the Part 2 Scores in multiplication for this group improved significantly. At the same time, however, the Part 1 Scores improved significantly. It cannot be said that the motor factor was under control in Part 2 (a typical rate test), since motor improvement seems to have been largely responsible for the rise in mean score.

Since the Group A (control) results in multiplication displayed no significant Part 2 Score improvement, no statement can be made as to whether the motor factor was under control here. These results serve, however, as a pointer for the conclusion drawn in the preceding paragraph.

[14] Although (see above), since both experimental and control groups improved commensurately, it would be impossible to isolate the cause of the improvement; one could only say that improvement did occur.

The fact that the experimental group improved significantly, while the control group's improvement was smaller than its sigma of the difference, would seem superficially to indicate the effectiveness of training in the case of Group A; (although the more refined work done in Table IV would contradict this). Since such a conclusion might be made, it is interesting to note again that the apparent improvement in multiplying ability seems to have been largely dependent on simultaneous improvement in motor performance, or copying.

The first part of the problem may now be categorically resolved. It is inferred from the results of the present experiment that the motor factor is not under control in a conventional rate test in the simple arithmetical combinations.

That such control would be desirable is obvious. We therefore proceed to the second portion of the problem: to investigate the differential test technique to see whether it brings additional control into this situation.

As previously stated, the differential test is scored by finding what percent Score Part 2 is of Score Part 1. Since Score Part 1 represents the child's ability to do the motor work involved in Part 2, then the Percentage Score represents his ability to do the mental work of computation, with reference to his writing speed. A person who could perform the mental operations as fast as he could write the answers would have a Percentage Score of 100, since the Part 1 Score and the Part 2 Score would be identical.

Table III shows that, in the case of addition, while the Part 2 Scores were improving significantly, the Percentage Scores were actually dropping. For Group A, the drop is not significant. In the case of Group M (control), the critical ratio of 5.6 suggests that the fall in Percentage Score resulted from some well-defined special cause. One explanation might be that training in multiplication inhibited the addition function. However, Table IV shows that there actually was no significant difference between the slight drop of the experimental group and the greater fall of the control group.

The main cause of this drop is evident. Improvement in motor performance, as indicated by Part 1 Score, was so great as to obliterate improvement in Part 2 Score (computation plus motor work). It is clear that the Part 2 Score improvement does not mean actual growth of adding ability, as a conventional interpretation would state. Instead, it results entirely from increased motor speed.

It is concluded that the differential technique does bring increased control to the arithmetical rate test, to the extent that it successfully weighs the significant variation of the motor factor into any variation in ability to compute-and-write.

A different aspect of this control is seen in the case of Group M in the multiplication tests. This group displays significant improvement in Percentage Score as well as in Part 2 Score. The differential test interpretation would be that the apparent improvement in multiplying ability displayed by this group's Part 2 Scores is here valid in its direction, since the improvement persists in the Percentage Score change. Table IV additionally shows that the experimental group apparently benefited from the training process in true multiplying ability, since the difference between Group M and Group A in multiplication Percentage Scores is significant. The influence of motor performance as a factor in this change is seen, however, in the fact that the critical ratio of the change in Percentage Score is much smaller than the critical ratio of the change in Part 2 Score. While both changes are statistically significant, the Percentage Score change displays less significance than the Part 2 Score change. Hence the motor factor continues to exercise a limiting effect on the extent of the improvement.

Group A in the multiplication tests displays an insignificant drop in Percentage Score in comparison with an insignificant gain in Part 2 Score. This is consistent. If the Part 2 results had been accompanied by a significant rise in Percentage Score, grave doubt would have been thereby cast on the operation of the differential technique. The present results, however, display no significant variation.

SUMMARY

1. An experiment was devised, first, to determine whether the motor factor is under control in a "conventional" rate test in the simple arithmetical combinations, and second, to investigate the differential test technique to see whether it brings additional control into this situation.

2. Sixty sixth grade pupils were subjected to a series of differential tests, interspersed with training in the functions tested.

3. The training itself was found to have had no great effect.

4. Analysis of results brought the conclusion that motor performance is not under "good enough" control in the typical rate test, since significant change in score was accompanied by significant change in writing speed.

5. Further analysis resulted in the conclusion that the differential test brings further control into this situation, since Percentage Scores weighed the motor change with the computation change in such a way as to show that improvement of writing speed, rather than improvement in the mental functions, had partly or entirely caused the improvement in computation score.

In an experiment involving progressive changes in score, statistical treatment is not sufficient to bring out the results. Individuals within the group displayed marked variation in their growth reactions. Table IV shows that the experimental groups as wholes did not respond significantly to training; but that some individuals did respond to training is obvious from individual curves. Furthermore, Table III shows that the groups as wholes did not improve in Percentage Score (except Group M in multiplication); but individual curves show that some subjects did improve in Percentage Scores. Evidently analysis of the individual curves is needed before the full implications will be apparent.

OCCUPATIONAL SURVEY OF ALL THE GRADUATES OF AN IOWA HIGH SCHOOL

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Editor's Note: A valuable source of information relative to the effectiveness of school instruction can be found in follow-up studies of graduates. The author presents data for one high school.

IN MAY, 1941, an occupational survey was made of all persons who had graduated from the Sumner Iowa High School between the years 1892, the date of the first graduating class, and 1939 inclusive.

Sumner is located in a prosperous dairying section in the northeastern part of Iowa, 150 miles south of Minneapolis. Its population grew from 850 in 1892 to about 1750 in 1939. The first few graduating classes contained between five and ten persons and those during the latter part of the survey between forty-five and sixty persons.

The course of study of the High School during most of the period covered included four units of English, two of foreign language, three of social studies, one and one-half of mathematics, and two or three of science. Manual training, home economics, and normal training were introduced between 1916 and 1920. Bookkeeping was taught from the beginning and during the years 1927 to 1932, typing, commercial law, and shorthand were added. Smith Hughes homemaking was introduced in 1938. There has been a rather active extra-curricular program since 1925. The High School became a member of the North Central Association of Colleges and Secondary Schools in 1936.

The items in the following table have been arranged on the basis of descending magnitude. The total number of persons, both men and women, has been used in determining the order of each occupation. When two or more occupations had the same number of persons engaging in them an alphabetical arrangement has been used to establish the order of these occupations. This is illustrated by items 29 to 34.

The survey indicated, as would be expected, that most of the women (62.56 per cent) were married and engaged in the business of homemaking. The next largest group of women (7.58 per cent) were teaching. The women remaining who were classified were found to be listed under 18 different occupations with not more than 2.37 per cent in any one classification.

OCCUPATIONS IN MAY, 1941, OF ALL PERSONS GRADUATED FROM SUMNER, IOWA, HIGH SCHOOL FROM 1892 TO 1939, INCLUSIVE

		Totals		Per Cent		1892–99		1900–09		1910–19		1920–29		1930–39	
		Men	Women	Men	Women	Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.
	TOTAL GRADUATES	512	633	100.00	100.00	20	39	59	68	85	76	135	188	213	262
1	Unclassified	43	46	8.40	7.27	1	3	13	8	14	6	11	18	4	11
2	Deceased	28	34	5.47	5.37	9	8	8	9	8	7	0	7	3	3
3	Homemaker		396		62.56		23		44		53		127		149
4	Farmer	116	4	22.66	.63	1	2	8	2	3		30		74	
5	Teacher	20	48	3.91	7.58	1	2	2	5	3	5	9	15	5	21
6	Advanced education	26	11	5.08	1.72								1	26	10
7	Clerical	20	15	3.91	2.37			1		3	1	2	6	14	8
8	Salesman	22		4.30				2		7		6		7	
9	Mechanic	16		3.13								8		8	
10	Waiter & waitress	2	14	.39	2.21								1	2	13
11	Nurse		14		2.21		1				3		3		7
12	Stenographer		14		2.21								2		12
13	Unemployed	5	9	.98	1.42							1		4	9
14	Produce business	12		2.35				1		4		4		3	
15	Army & navy	11		2.15						1		1		9	
16	Store managers	9	2	1.76	.32	2		1				2	2	4	
17	Trucker	10		1.95				1				1		8	
18	Engineer	9		1.76				1		1		6		1	
19	Mail carrier	9		1.76				2		3		3		1	
20	Office worker	9		1.76				1		1		4		3	
21	Plumber	9		1.76				2		3		4			
22	Maid		8		1.27										8
23	Attorney	7		1.37				3				2		2	
24	Bookkeeper	3	4	.59	.63								1	2	3
25	Minister	7		1.37		1		2		1		1		2	
26	Banker	6		1.17				1				5			
27	Laborer	6		1.17						1				5	
28	Newspaper worker	4	2	.78	.32					2		1		1	2
29	Decorator, painter	5		.98				2		2				1	
30	Dentist	5		.98						3		2			
31	Insurance worker	5		.98						2		2		1	
32	Lumberman	5		.98				2		3					
33	Railroad agent	5		.98		1		1		3					
34	Sales manager	5		.98								5			
35	Accountant	3	1	.59	.16							2		1	1
36	Buyer	4		.78				1		1		2		1	
37	Creamery worker	4		.78											

OCCUPATIONS IN MAY, 1941, OF ALL PERSONS GRADUATED FROM SUMNER, IOWA, HIGH SCHOOL FROM 1892 TO 1939, INCLUSIVE—Continued

		Totals		Per Cent		1892–99		1900–09		1910–19		1920–29		1930–39	
		Men	Women	Men	Women	Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.	Men	Wo.
38	Doctor, M. D.	4		.78						3		1			
39	Oil co. worker	4		.78				1				2		1	
40	Postmaster	3	1	.59	.16					1	1	2			
41	Telephone worker	4		.78		1		1				1		1	
42	C. C. C. C. C. Camp	3		.59										3	
43	Cosmetology		3		.47								2		1
44	Real estate agent	3		.59		1				2					
45	Baker	2		.39										2	
46	Bureau head	2		.39						2					
47	Carpenter	2		.39						1		1			
48	Chemist	2		.39						1				1	
49	Clothier	2		.39								2			
50	Electrician	2		.39								1		2	
51	Factory worker	2		.39						2				1	
52	Investment broker		2		.32								1		1
53	Librarian	2		.39						1		1			
54	Musician	2		.39								2			
55	Peace officer		2		.32								2		
56	Photographer	2		.39		1		1							
57	Recreation parlor	2		.39								2			2
58	Secretary		2		.32									2	
59	Telephone operator	2		.39										1	
60	Theater operator	2		.39										1	
61	Welder	1		.19								1			
62	Architect	1		.19										1	
63	Baseball	1		.19						1					
64	Game warden	1		.19				1							
65	Contractor	1		.19						1					
66	Dry cleaner	1		.19								1			
67	Farm Bureau officer	1		.19										1	
68	Feed mill operator	1		.19						1					
69	Funeral director	1		.19								1			
70	Highway patrolman	1		.19								1			
71	Implement dealer	1		.19											
72	Inspector	1		.19		1						1			
73	Optometrist	1		.19											1
74	Railroad worker	1		.19											
75	Theater usher		1		.16										

The most significant fact connected with the occupations of the men is the great amount of variety present. Not counting the unclassified and deceased there were 442 men engaged in 66 different occupations. The largest single per cent (22.66) were engaged in farming. Not more than 4.30 per cent were found in any other one occupation.

World War II is, of course, causing many changes in the occupational status of the persons covered in the survey. However, there are probably as many different occupations being followed now by the persons surveyed as at the time of the survey in 1941. Also the fact that the Spanish–American War and World War I were fought during the years covered by the study, 1892 to 1939 inclusive, tends to give stability to the figures.

The results obtained from the survey strongly suggest the wisdom of giving comprehensive training in homemaking in the high school. It would also seem wise to offer Smith Hughes vocational agriculture in the rural high school in view of the fact that farming was the occupation of 22.66 per cent of the men. There were more than one hundred graduates in commerce occupations which justifies the teaching of commercial subjects.

Although there appears to be sufficient proof in the findings to warrant some vocational teaching, the great spread in the number of vocations represented shows clearly the need for education that is general in nature. The geographical distribution of high school graduates likewise indicates the wisdom of this type of training.[1]

The school should develop those personal qualities and skills that go with success in all worth while lines of work and which at the same time tend to make for a better social and political situation locally, within the states, and among the nations. The Sumner School took pride in the fact that there did not appear to be a single Sumner graduate who had served time in a penal institution for conviction of crime. Teachers should take advantage of every opportunity in and out of the classroom to develop those qualities of human relationship and civic responsibility of which Dr. Carr[2] writes in the *Purposes of Education in American Democracy* even if their doing so does result in lessened emphasis elsewhere.

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[1] Walter L. Hetzel, "Geographical Study of All Graduates of an Iowa High School," *School Review*, L (April, 1942), 294–297.

[2] Educational Policies Commission, *Purposes of Education in American Democracy:* National Education Association, 1938, 73–91 and 109–125.

THE RELATION OF SOCIO-ECONOMIC STATUS TO EDUCATIONAL ACHIEVEMENT IN GRADES FOUR TO EIGHT

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Editor's Note: There has been long standing interest in the nature-nurture factors in performance. The author finds a substantial relationship between socio-economic status and achievement.

INVESTIGATION of the relationship between socio-economic status and pupil achievement extends back a little more than 30 years. In the literature there are to be found numerous articles dealing with the subject, although in some cases the treatment of the data on the subject at hand is incidental to some other purpose.

All of the investigations have indicated the existence of a definite relationship between socio-economic status and scholastic achievement. It is the purpose of this article to summarize briefly the previous findings and to present some additional data.

PREVIOUS INVESTIGATIONS

The first investigations of the relationship between home background and educational achievement dealt with problems of retardation, elimination, and persistence in school. Those of Neighbours (12), Van Denburg (16), and Holley (11) obtained evidence of a definite relationship between the level of home environment and progress and persistence in school.

Garrison (8) made a comparison of the relative influence of intelligence and socio-economic status upon the information possessed by a group of first grade pupils, as indicated by the Sangren Information Test. The results on the information test were treated by comparing the scores made by the upper and lower halves in intelligence test performance, holding socio-cultural status constant. There was a difference in favor of the high mental ages, but the difference was not so great as that between the upper halves in socio-economic status, with the mental ages held constant.

Engle (6) studied the relation between home environment and school marks. In that investigation three groups of high school pupils of differing

* This article reports in part the writer's master's thesis written in the College of Education. The work was done under the supervision of Professor J. B. Stroud.

socio-economic status were compared upon the basis of marks earned. The privileged group was made up of pupils from home subjectively rated as well to do. A second group was randomly selected from pupils not included in the privileged and unprivileged groups. The latter was made up of pupils whose families had received public assistance. The results by per cent of the three groups earning the various letter grades are as follows:

	A	B	C	D	E
Privileged	19	31	28	17	5
Randomly selected	12	20	30	30	7
Unprivileged	5	18	33	32	12

Hilliard and Troxell (10) investigated the relation between informational background, reading readiness, and the reading progress of primary grade children. The subjects were divided into a "rich-background" group and a "meager-background" group. The rich-background group had a significant advantage in reading readiness, and in the second grade, averaged six months above the standard in reading. The meager-background group averaged one month below the standard.

Coleman (3) reported the study of approximately 4,800 cases in the 7th, 8th, and 9th grades, representing all of the geographic regions of 43 states. The total group was divided into four nearly equal groups representing high, normal, and low socio-economic states and a fourth group whose parents had received "relief." Differences between Q1, the median, and Q3, were found to favor the higher groups for every grade in chronological age, in test intelligence scores, reading scores, geography scores, history scores, and problem solving scores.

Other studies of this class giving definite evidence of a relationship between socio-economic status and achievement are those of Collins and Douglas (4), Long (12), Gesell and Lord (9), Porter (14), Smith (15), and Williams (17).

Another group of investigations has used the correlation technique to obtain an expression of the relationship between socio-economic status and educational achievement. This group includes the studies by Bryan (1), Chauncey (2), Cuff (5), and Flemming and Rutledge (7).

Chauncey studied a group of 113 eighth grade and 130 ninth grade pupils. Scores made on the Sims Score Card for Socio-Economic Status cor-

related with those earned on the Stanford Achievement Test to the extent of $r = .30$ (8th grade) and $r = .35$ (9th grade). When intelligence test scores were partialed out, the coefficients were .23 and .30, respectively.

For a group of 169 fourth, fifth, and sixth grade pupils Bryan correlated Sims scores with school marks and with Metropolitan Achievement Test scores. She obtained a coefficient of .56 between marks (averaged for 6 semesters) and Sims scores, and of .59 between Metropolitan scores and Sims scores; and a partial correlation coefficient of .35 between Sims scores and marks with Otis *I Q* held constant.

PROCEDURE

The subjects used in this investigation were 280 pupils in the 4th, 5th, 6th, 7th, and 8th grades of the public schools of Sheldon, Iowa. Socio-economic status was measured by the Sims score cards. Educational achievement was measured by the Stanford Achievement Test, Form D, and by an average of the school marks for the school year 1939–40 and the first semester of 1940–41. Intelligence test scores were obtained by use of the Otis Self-Administering Tests of Mental Ability, Intermediate Examination, Form A. Correlation coefficients were obtained between the various measures; and the sample was divided into fourths according to Sims scores and the mean school mark and Metropolitan score determined for each fourth in socio-economic score.

RESULTS

The sample was found to have a mean socio-economic status score of 17.1, a median of 16.7, and a standard deviation of 6.7. By comparison with Sims's norms the sample may be taken to be representative of the population in general with respect to both central tendency and dispersion.

TABLE I

CORRELATION COEFFICIENTS OBTAINED BETWEEN THE VARIOUS MEASURES

Measures	r
Sims Scores and Educational Quotients	.41
Sims Scores and Stanford Achievement Raw Scores	.39
Sims Scores and Average School Marks	.38
Sims Scores and Grade-Placement Quotients	.37
Sims Scores and Intelligence Test Scores	.32
Educational Quotients and Intelligence Test Scores	.80
Sims Scores and Educational Quotients (Intelligence Test Scores partialed out)	.27

Table I gives the coefficients obtained between Sims scores and the various achievement factors studied. The coefficient for the Stanford Achievement raw scores was obtained by combining the coefficients of the five grades by a weighted average. The grade-placement quotient which is correlated with Sims scores, was obtained by dividing the grade equivalents of the earned scores by the actual grade position of the pupils.

When the total group was divided into fourths and ranked from high (4) to low (1) according to socio-economic status, the mean educational achievements of the sub-groups ranked in the same order as the socio-economic status. Table II gives the mean achievement score at each of the 4 socio-economic levels for the factors studid.

TABLE II

MEAN SCORE OF EACH FOURTH OF THE SIMS SCORE DISTRIBUTION

Sims Scores by Fourths	Educational Quotients	Intelligence Quotients	Grade-Placement Quotients	Average School Marks
4	108. 52	113. 74	115. 06	3. 48(C+)
3	102. 99	108. 24	104. 01	3. 06(C)
2	97. 80	104. 79	98. 33	2. 74(C—)
1	93. 27	103. 67	92. 21	2. 55(C—)

By converting the mean achievement scores for each group into z-scores and then into percentile ranks on the normal probability curve, it was found that the highest fourth scattered about the 72nd percentile as a mean, the next highest fourth scattered about the 54th percentile as a mean, the next to the lowest fourth scattered about the 41st percentile as a mean, and the lowest fourth scattered about the 32nd percentile.

SUMMARY

On the whole, evidence is obtained of a fairly substantial relationship between socio-economic status and academic achievement. A coefficient of .41 was obtained between the scores on the Sims Score Card and Standard Achievement *E. Q*'s; a weighted average coefficient for the 5 grades of .39 between Standard Achievement raw scores and Sims scores; and a coefficient of .38 between average marks and Sims scores. With test intelligence partialed out a coefficient of .27 was obtained between Stanford Achievement *E Q*'s and Sims scores.

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AN EXPERIMENT IN THE CHARACTERISTIC LIMITATIONS OF CORNETS AND TRUMPETS AND ITS IMPLICATION FOR TEACHING

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Editor's Note: Music is a field offering many possibilities for experimental research. The author offers important facts on the tuning of band instruments.

MANY problems of internal tuning are presented by woodwind and brass instruments. These have not entirely been solved by the research departments of the manufacturers. An important factor in woodwind instrument construction is the extended scale which involves the register keys. Any single register can be built in tune by a proper placement of the tone holes, but this will not be correct for the other registers. The manufacturer, therefore, is forced to compromise in spacing the holes with the result that some notes are in tune and others are slightly sharp or flat. This compromise makes it possible to have the extended scales, without which some tones will be too far out of tune to be usable.

The brass instruments are open tubes and they respond naturally to the 'just' or partial series. The internal tuning is conditioned by the fifth mode[1] of vibration which is fourteen cents[2] (hundredths of a semitone) flat when compared to the equally tempered scale. Instrument builders use a correction for the fifth mode of vibration, however, this correction raises the sixth mode[3] of vibration which becomes too sharp. Again a compromise is necessary to avoid much difficulty. The tones resulting from the use of valve slides offer more problems. When the tones produced through the use of one valve slide are in tune, those made by a combination of valves are usually too sharp. The low C sharp which is produced by all three valves in combination is about one-half semitone high. These are only some of the problems which confront the manufacturers of wind instruments.

It is the belief of the writer that the scientific study of characteristic limitations of instruments constitutes a step toward improving musical performance and teaching. In order to determine some of these limitations

[1] The fifth mode of vibration on a cornet is the E_5, fourth space treble staff.
[2] Cents—commonly used to designate hundredths of a semitone.
[3] The G_6, space above the staff.

a study was made with the cooperation of the cornet players of the Northwestern University Summer Band (1941). The following tests were made: (1) The range of tuning. (2) The typical internal tuning of the open tones. (3) The range of performance by various players on the same mouthpiece and instrument. (4) The measurement of the effect of the depth of mouthpiece cup on tuning of a trumpet.

PROCEDURE

Fourteen cornet players of the Summer band assisted at various times to make the experiment possible. The equipment used consisted of a comparison trumpet, three different depth mouthpieces, a thermometer, and a Conn Chromatic Stroboscope.[4] The individual participant played the open tones of his instrument up and down consecutively for a total of five trials. The frequency of each tone was measured and an average taken of the five trials. This procedure was followed for the comparison trumpet using a different depth mouthpiece for each series of five trials. Since the tests were conducted at various room temperatures, an allowance was made to adjust the results to a common standard. A standard of 72 degrees Fahrenheit was used and the correction in cents, —.9 (room temperature—72) was made.

RESULTS AND SUMMARY

The range of tuning of the fourteen cornet players in the Summer band was one-half semitone (49.7 cents). The players had made no attempt to tune to a common standard before rehearsals or concerts. The average tuning was 11.8 cents above the A–440 standard. The typical internal tuning of the open tones of all the cornets and trumpets was: C_4 (low C), 11.1 cents sharp; G_4, 6.5 cents sharp; C_5, 8.1 cents sharp; E_5, 8.6 cents sharp; G_5, 20 cents sharp, and C_6, 16.5 cents sharp. The tones were near the 11.8 cents average with the exception of the G_5 (space above the staff) which was 20 cents sharp. This tendency was the same in all instruments tested.

[4] The Conn Chromatic Stroboscope is based on a synchronous motor, supplied by a fork unit with 55 cycle power and intermittent light, the frequency of which is controlled by pulsations of sound reaching a microphone. Twelve rotating disks, representing the equally tempered semitones in an octave, are each imprinted with a pattern of seven rings of alternate light and dark segments progressing radially for a range of seven octaves. Intermittent light superimposed upon disks revolving at a constant rate forms an image, which adjusted to a position of no apparent movement, indicates a frequency reading on the dial. The error of this reading is less than five hundredths of one percent.

The range of performance by all players using the same deep mouthpiece and comparison trumpet extended from minus 17 cents to 19 cents, a variation of about one-third semitone (36 cents). This range of performance can not be attributed to any reason except differences in embouchures. The medium depth mouthpiece and comparison trumpet ranged from minus 6 cents to 25 cents, and the shallow depth mouthpiece and comparison trumpet ranged from plus 9 cents to 32 cents. By comparing these ranges it can be seen that the tuning of the comparison trumpet was raised as the depth of the mouthpiece was reduced. The internal tuning of the trumpet was not appreciably affected by the different depth mouthpieces.

These results have implications for the improvement of musical performance. Careful tuning of a band is of paramount importance. The G_5 is always played too sharp in respect to the average internal tuning of the instrument. This no doubt is the effect of over compensation, that is, in correcting the E_5, which would normally be too low in pitch, the manufacturers have raised the G_5 too much. In playing a cornet it may be necessary to 'lip' the tones G_5 and F_5 down somewhat to be better in tune. The C_6 (high C) is also too sharp, but not so much as the G_5. If a participant has a tendency to play too flat or someone in the section has a weak embouchure, it appears that an improvement will be gained by using a mouthpiece of less depth.

THE NUMBER OF IMMATURE PUPILS FOUND IN A GROUP OF 176 CHILDREN

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Editor's Note: Maturity is an important factor in learning. The author finds from a study of radiography that 36.9% of the children studied had immature bodies.

THE PURPOSE OF THIS STUDY

FAILURE in school may be due to a central nervous system which has not matured sufficiently for the child to have the degree of intelligence necessary for learning to read at the grade level where he has been placed by his teacher. It is the opinion of some medical authorities[1] that the maturity of a pupil's central nervous system may be indicated by his stage of bodily maturation. Hence, the purpose of this study was to find among 176 failing pupils those children who had immature bodies.

THE PROCEDURE USED

Four town school systems were used in this investigation. These towns are in Eastern Kentucky. With one exception the population of the towns which these schools served ranged from 4,000 to 35,000.

The examiner wanted pupils so selected that a pupil's teacher could say, "This child is not succeeding in experiencing his pupil-teacher planned curriculum, but I cannot find any evidence which would indicate even one cause for his lack of success". It was thought that pupils selected as described might present some evidence of bodily immaturity. The criteria used in selecting the pupils are presented here: (1) Select only those pupils who are *not* successfully experiencing their pupil-teacher planned curriculum. (2) Pupils must have attended only the elementary school in which they are now enrolled. (Do not use this criterion when selecting pupils to be studied who are not enrolled in the first grade.) (3) Pupils must have been in attendance 80 per cent of this school year. (4) Pupils must possess average or superior mental ability. (5) The English language must be the only language spoken in each pupil's home. (6) Pupils must be free from physical defects. (7)

[1] Saucier, W. A. *Theory and Practice in the Elementary School.* New York: The Macmillan Company, 1941. Chap. I:11.

Pupils must be free from speech handicaps. (8) Pupils must not have emotional blocks. And (9) a wholesome pupil-teacher-parent relationship must exist. The principals assisted their teachers in selecting the pupils according to the criteria presented above.

The teachers and principals selected 176 pupils. The pupils selected were rated as failures by their teachers. These failing pupils were enrolled in grades one, two, and three.

A portable, shock-proof X-ray was used in obtaining a radiograph of each pupil's left hand and wrist. The distance from the film to the focal spot on the X-ray tube was thirty inches; this distance was kept constant for each pupil. Non-screen film was used. Each pupil's left hand was placed palm down on the film holder with the fingers slightly separated and a posterior-anterior radiograph made of hand and wrist. The length of exposure was varied slightly, depending upon the size of a pupil's hand. For a small child's hand the examiner set the timer for a shorter exposure than he did for a large child's hand.

Todd's 1937 standards[2] were used in assessing the radiographs obtained in making this study. Todd's "Differential Skeletal Maturation method" of assessing radiographs was followed closely. The Differential Skeletal Maturation method uses the contour characteristics of the metacarpal and phalangeal epiphyses as the chief determinators of skeletal maturity. The radial epiphysis, and also the carpal centers were studied, but not much weight was attached to the evidence of maturity which they presented. Todd considered skeletal age to be an excellent indicator of a child's bodily maturation.

THE FINDINGS

Table I presents a summary of the data obtained on the skeletal age distributions of 176 pupils.

The standards used in determining the relationship between skeletal age and chronological age as shown in Table I were arbitrarily chosen.

Sixty-five pupils or 36.9 per cent of the failing pupils had skeletal ages which were less than their chronological ages which means they had immature bodies. Table I shows that almost one out of every four failing pupils used

[2] Todd, T. Wingate. *Atlas of Skeletal Maturation*. St. Louis: The C. V. Mosby Company, 3523 Pine Blvd., 1937.

in this study had a skeletal age which was eighteen months or more below his chronological age. Table I also shows that one out of every eight failing pupils had a skeletal age which was from ten to seventeen months below his chronological age. Ninety-five pupils or 53.9 per cent of the failing pupils used in this investigation had skeletal ages which were approximately the same as their chronological ages. Sixteen of the 176 pupils had skeletal ages which were higher than their chronological ages by ten months or more.

TABLE I

SKELETAL AGE DISTRIBUTIONS OF 176 PUPILS ENROLLED IN GRADES ONE, TWO, AND THREE IN SELECTED TOWNS IN EASTERN KENTUCKY

The Relationship Between Skeletal Age and Chronological Age	Number of Pupils Selected				Total	Per Cent
	Town A	Town B	Town C	Town D		
Underage* 18 months or more	25	4	5	8	42	36.9
Underage 10 to 17 months	14	4	1	4	23	
Normal age, 9 months under to 9 months over chronological age	59	5	9	22	95	53.9
Overage 10 to 17 months	3	2	2	1	8	9.2
Overage 18 months or more	3	1	0	4	8	
Total	104	16	17	39	176	100.0

* The terms (underage, normal age, and overage) are used to express the relationship of a pupil's skeletal age to his chronological age.

SUMMARY

A study of the radiographs made of the 176 children shows that sixty-five pupils or 36.9 per cent of the group had immature bodies. Normal bodily maturation was found in ninety-five pupils or 53.9 per cent of the group. Bodily maturation in excess of chronological age was found in sixteen pupils or 9.2 per cent of the 176 children.

An examination of the 176 radiographs made in this study shows one fact not directly related to the purpose of this investigation which may be of interest to the reader. For instance, thirty-one pupils had arrested structural growth. Some authorities[3] are of the opinion that, if a pupil has arrested structural growth, it is quite probable that he has an arrested development of the central nervous system.

[3] W. A. Saucier, *op. cit.*, chapter I.

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AN EXPERIMENT IN THE USE OF GOAL SHEETS IN NINTH GRADE MATHEMATICS

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Editor's Note: Teachers are interested in new means of getting better results. The author finds goal sheets effective in ninth grade mathematics.

THE purpose of this experiment was to determine the effect of the use of goal sheets upon achievement in the 2nd semester of ninth grade mathematics.

Two sections in ninth grade general mathematics, each containing twenty-four pupils, were used in the study. The classes met during the third and fourth periods in the morning, both groups meeting in the same room, with the same teacher. The sections were carefully equated on the bases of scores obtained on the Otis Self-Administering Test of Mental Ability and achievement in ninth grade mathematics during the first semester. The course material for the second semester was arranged in five units and presented to both groups in exactly the same manner. As work was begun on each new unit, each member of the experimental group was furnished with a goal sheet. The teacher explained the purpose of the goal sheets and pointed out that the full cooperation of all pupils in the use of the sheets was essential if any benefit was to be derived. These sheets were not supplied to the control group.

The goal sheets were mimeographed forms, at the top of which the pupils entered their names, date each sheet was issued, subject, and unit. The teacher then read a list of goals or things to be learned during the unit. These goals were copied on the sheets by the pupils. A separate column was provided for checking off each goal as it was accomplished. For example, one of the goals was to learn how to bisect an angle. The pupils wrote on their goal sheets, "Learn how to bisect an angle." As each pupil became certain he had mastered this skill, he entered a check-mark next to this goal in the column provided for checking off accomplished goals. Each textbook had a paper pocket fastened to the inside of the back cover. The goal sheets were kept in these pockets where they could be referred to at any time.

At the end of each unit, an objective test was administered to both groups. These tests were constructed by the teacher and covered the course material thoroughly. Since the list of goals for each unit was compiled di-

rectly from the course material, the knowledge and skills called for in the goals and the material called for on the tests were closely related. Throughout the duration of the study great care was taken to keep all factors except the experimental variable constant.

The table below shows the scores obtained by the control and experimental groups on each of the five tests mentioned in the preceding paragraph. The experimental group, it will be noticed, scored higher on each of the examinations. The differences, favoring the experimental group, are all significant except in the case of the third test. The mean difference of 6.6 per cent is also significant.

GROUP AVERAGES ON UNIT TESTS

Test	Control Group Average (per cent)	Experimental Group Average (per cent)	Difference in Favor of Experimental Group (per cent)
1	81	94	13
2	74	80	6
3	73	74	1
4	70	77	7
5	77	83	6
Mean	75	81.6	6.6

Using equated pairs, a ranking was made of the amount by which the experimental group member of each pair gained more than the control group member of each pair. Correlations were computed to determine the relationship between rank in gain of experimental group members over corresponding control group members, and rank in I. Q. of the experimental group members; and between this rank in gain and rank in first semester mathematics grades of experimental group members. Both of these correlations indicate negative relationship. The correlation between rank in gain and rank in I. Q. was found to be —.35. The correlation between rank in gain and rank in first semester mathematics grades was found to be —.23. These negative correlations indicate a tendency for mathematics pupils low in intelligence and pupils low in mathematics achievement to profit more from the use of goal sheets than pupils higher in intelligence and mathematics achievement.

In the study hall, it was noticed that the experimental group members, by using their goal sheets, were enabled to study for mathematics examinations more methodically than were control group members. During mathematics classes, it was observed that experimental group members understood more clearly what was going on than did control group members and that the questions asked by experimental group members were more intelligent than were those asked by control group members.

The following conclusions seem to be justified by this study.

1. Goal sheets are probably an aid to learning in mathematics.

2. Goal sheets seem to be of more help to dull than to bright pupils.

3. Goal sheets seem to be of more help to pupils low in mathematics achievement than to pupils high in mathematics achievement.

They provide an objective list of the points to be covered and are valuable as aids in studying for examinations. As with any such aid, the goal sheet technique must have the full cooperation of the pupils if it is to be a real success.

A NOTE ON THE ACCURACY OF TEACHERS' SCORING OF SEMI-OBJECTIVE TESTS[1]

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Editor's Note: There are many educational outcomes that cannot be readily measured objectively. The author recommends trained scorers for semi-objective tests.

IN SCHOOLS having testing programs, it is a common practice to use teachers in the scoring of the tests. The value of the test results of course depends partly upon the accuracy of the scoring. An occasional error of one or two points may occur even in the best of scoring, but such errors should be so small and so infrequent that they do not significantly influence the ranking of the pupils. The question of the accuracy of teachers' scoring is therefore of considerable importance.

The majority of the better standard tests now consist wholly or mainly of purely objective items, such as the multiple-choice, true-false, and matching types. It is comparatively easy to get a high degree of reliability in the scoring of completely objective items, although experience shows that even when the tests consist entirely of these kind of items, it is advisable to select and train the scorers carefully and to carry out a systematic plan for checking the accuracy of the scoring.

Some tests—particularly certain achievement test batteries widely employed in the elementary school—make extensive use of completion items. Questions of this kind not only involve accurate perception and motor coordination on the part of the scorer, but they also frequently call for judgment with respect to whether or not various answers written by the pupils should be accepted as correct. This subjective element greatly increases the difficulty of obtaining high reliability of scoring.

Some data on accuracy of scoring of a semi-objective test were secured in a small experiment carried on in a summer session class in standard tests. The group was composed almost wholly of elementary-school, secondary-school, and junior-college teachers.

The data were based on a scorers' test consisting of items selected from the various forms of the reading, English usage, arithmetic, and spelling

[1] The assistance of Mr. Leonard Towner, graduate student at the University of California, in preparing the data for this article is gratefully acknowledged.

sections of the Metropolitan Achievement Tests. Responses which had been given by different pupils to the various items and which were chosen to bring out certain difficulties in scoring were entered in the blanks following the questions. The whole thing was then duplicated by the offset process. The finished product had the appearance of a test written by one pupil. It should be made clear that the test was deliberately prepared to try people out on certain scoring procedures and that it contained more pitfalls for scorers than semi-objective tests usually do.[1]

Each of the fifty-five members of a class in standard tests was supplied with a copy of the test, a scoring key, and directions for doing the scoring. About thirty minutes of a class period were used in having the students score the test in accordance with the mimeographed directions. Very few of the students had had experience in scoring the Metropolitan test. Consequently, they worked slowly, and less than one-third of them finished the scoring in the time allowed.

The scoring done by the students was itself scored by means of a key prepared by the instructor. Each student's accuracy of scoring was computed on a percentage basis. The divisor was the number of items which the student attempted to score.

The mean percentage of items scored incorrectly was 18.4. The standard deviation was 5.6. The range in percentage of scoring errors was from 8.6 to 34.8. The fact that nearly one-fifth of the items attempted were scored wrongly and that the most inaccurate scorers were wrong in about one-third of their attempts shows that the scoring of semi-objective tests is not the simple and easy matter that it may appear to be.

The correlation between per cent of items scored incorrectly and total number of questions scored by each individual was $-0.91 \pm .090$. In other words, there was a slight tendency for the slower workers to make the more scoring errors, although the correlation was too low to be significant.

The data here reported emphasize the advisability of using trained scorers for semi-objective tests and of carefully checking the scoring. They also suggest that people who work rapidly should be chosen as scorers, since they seem to make no more errors than those who are slow and they can of course get the work done more quickly.

[1] This scorers' test was prepared by Mrs. Anne Johnson, who supervises one of the scoring departments in the Educational Records Bureau. It is now a part of the Bureau's procedure in selecting scorers for the Metropolitan tests.

THE STAGE OF BODILY MATURATION FOUND IN 318 FIRST-GRADE PUPILS

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Editor's note: The importance of maturation in learning seems to have been established. The author presents data on the maturity of first grade pupils.

THE important part maturation plays in learning is evidenced by the results obtained in co-twin experiments. The investigators (3) who have conducted co-twin experiments are of the opinion that training is more effective if it is introduced at the proper stage of maturation. Dashiell (1:92) states that the results obtained by these investigations "emphasize the fact that learning is by no means the whole story, and that it must be built upon the substructure of organic growth." The late Dr. T. Wingate Todd's (6) resarch on measuring bodily maturity seems to have opened the way for the making of a more accurate estimate of a child's stage of bodily maturation than has been possible in the past.

PURPOSE

The purpose of this study was to determine the number of pupils with immature, normal, or accelerated bodily maturation in a group of 318 pupils who enrolled in the first grade in September, 1942.

SUBJECTS

Pupils were selected from the following schools: (a) Three state teachers colleges; (b) one church college; (c) one state university; and (d) six public elementary schools. All the pupils in one classroom in each school were used. The number of subjects selected from the laboratory schools in teacher training institutions was 104. The number of pupils selected from the six public elementary schools was 214. The total number of subjects used in this investigation was 318.

PROCEDURE

A posterior-anterior radiograph was made of each pupil's left hand and wrist. A portable, shock-proof X-ray was used in obtaining the radiographs. Thirty inches was the distance from the focal spot on the X-ray tube to the

film for each radiograph made in this study. The length of exposure was one second. Non-screen film (size 8 x 10 inches) was used.

Todd's Differential Skeletal Maturation method of assessing radiographs was used in assessing the 318 radiographs obtained in this investigation. As a consequence, the metacarpal and phalangeal epiphyses were used as the chief determinators of the stage of bodily maturation of the substructure of each child's organic growth. Todd's 1937 standards were used in estimating each child's stage of bodily maturity. The estimate obtained by assessing a radiograph by Todd's standards is called the child's skeletal age.

DATA

Table I presents the skeletal age distributions of 318 children who enrolled in the first grade in September, 1942.

The standards used in determining the relationship between skeletal age and chronological age as shown in Table I were arbitrarily chosen.

TABLE I

THE NUMBER AND PER CENT OF PUPILS WHO WERE IMMATURE, NORMAL, OR ACCELERATED IN BODILY MATURITY AMONG 318 FIRST GRADE PUPILS

Stage of Bodily Maturation	Teacher-Training Institutions		Public Elementary Schools		Total	Per Cent
	Number of Pupils	Per Cent	Number of Pupils	Per Cent		
18 months or more below C. A.*	7	6.73	28	13.08	35	20.75
10–17 months below C. A.	9	8.65	22	10.28	31	
9 months below—9 months above C. A.	71	68.27	139	64.95	210	66.05
10—17 months above C. A.	11	10.57	17	7.94	28	13.20
18 months or more above C. A.	6	5.78	8	3.75	14	
TOTAL	104	100.00	214	100.00	318	100.00

* Chronological age.

Table I shows that of the 214 pupils in the six public elementary schools there were 28 pupils whose stages of bodily maturation were from eighteen months to twenty-four months below their chronological ages. This means that these children had the maturity of a normally developed child of four

or four and one-half years. Such children would usually be admitted to a nursery school, but for the school year 1942–1943 they were placed in a first grade. Of the 104 pupils selected from the teacher training institutions, there were seven pupils whose stages of bodily maturation ranged from eighteen months to twenty-four months below their chronological ages. Such data seem to indicate the urgent need for X-raying all children on entrance to the first grade in order that their teachers may be able to adjust the curriculum to each child's level of bodily maturity.

An examination of the 318 radiographs obtained in this study shows some facts not directly related to the purpose of this investigation which may be of interest to the reader. These facts are (1) 116 pupils had arrested structural growth; (2) 35 pupils had delayed gonadal action; and (3) 26 pupils had scorings on the radius. When the substructure of organic growth is arrested in infancy the child's network of blood vessels in the brain is not adequate for carrying a rich supply of blood to that organ (5:18) which means that the child's mental growth may be retarded. Delayed gonadal action as evidenced by lack of closure of the epiphyses arresting the growth of the second metacarpal may indicate that the gonads are not functioning properly (2:146). Scorings on the radius are evidence that the child has had a severe illness which would seriously interfere with the substructure of organic growth (4:48).

SUMMARY

Sixty-six pupils or 21 per cent of the children used in this study had a stage of bodily maturation ten or more months less than their chronological ages. Normal bodily maturation was found in 210 of the 318 pupils; this is 66 per cent of the total group. Bodily maturation in *excess* of chronological age by ten or more months was found in forty-two or 13 per cent of the total number of pupils used in this investigation.

In the teacher training schools the relationship between immaturity, and normal and accelerated growth is in this ratio—immaturity: normal and accelerated growth as 1:6. In the public elementary schools the relationship of immaturity to normal and accelerated growth is in this ratio—immaturity: normal and accelerated growth as 1:4. When the two groups are combined the relationship of immaturity to normal and accelerated growth is in this ratio—immaturity: normal and accelerated growth as 1:5.

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EXPLORATORY RESEARCH ON STUDENTS' PROBLEMS

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Editor's note: There is evidence all along the educational front that workers wish to move up closer to the scene of action. The author presents an instrument for getting problems from pupils.

AN INSTRUMENT for the study of students' problems has recently been developed which offers possibilities for several kinds of research. The results can be immediately practical to counselors, teachers, and school administrators, or they can be directed toward long-time studies of human behavior. The purpose of this article is briefly to describe the instrument and to sketch some of the research possibilities.

The instrument is a problem check list, composed of short phrases which represent common problems of students. The student uses the list by marking the problems which are of particular concern to him and by writing a summary in his own words.

Three forms of the check list have been developed; one for use at the college level, another for the high-school level, and a third for the junior-high-school level.[1] The college and high-school forms contain 330 items, and the junior-high-school form, 210.

Sample items from the high-school form illustrate the phrasing: "In too few school activities", "Shyness", "Having no close friends", "Lost—no sense of direction in my life", "Confused in my religious beliefs", "Moral code weakening", "Needing to decide on an occupation", "Family opposing my choice of vocation", "Not liking school", "Slow in reading", "Wanting more help from the teacher", "Employed late at night on a job".

In each of the forms, the items are classified into general areas. The college and high-school forms contain eleven areas with almost identical headings: (1) "Health and Physical Development," (2) "Finances, Living Conditions, and Employment", (3) "Social and Recreational Activities", (4) "Courtship, Sex, and Marriage", (5) "Social-Psychological Relations",

[1] The respective titles are: "Problem Check List, College Form"; "Problem Check List, High School Form"; "Problem Check List, Junior High School Form". Readers are invited to write the author at the Bureau of Educational Research, Ohio State University, Columbus, Ohio, if they care to receive a free sample copy of one or more of these forms. (Inclusion of 3¢ postage for each sample will be appreciated.)

(6) "Personal-Psychological Relations", (7) "Morals and Religion", (8) "Home and Family", (9) "The Future: Vocational and Educational", (10) "Adjustment to School Work", and (11) "Curriculum and Teaching Procedures." The junior-high-school form contains seven areas with modified headings. On each of the three forms thirty problems are listed in each of the areas.

Prior to the actual use of the check list, it is the tendency of many adults to assume that youth will be unwilling to mark their personal problems. Such does not turn out to be the case, however. The average number of problems marked by college students is thirty,[2] by high-school students twenty-seven,[3] and by junior-high-school students twenty-three.[4] The range of responsiveness is very wide, running from less than half a dozen problems to well over 100. Furthermore, students indicate that they enjoy using the lists: Over ninety per cent of the college students respond "yes" to the question, "Have you enjoyed filling out the List?"[5] A higher per cent holds for the high school.[6] Results are not yet available on this point for the recently published junior-high-school form.[7]

Students not only seem to appreciate a chance to express their problems in writing, but they go further, in a large proportion of cases, to ask for personal help with their problems. The proportion at the college level is sixty per cent replying "yes" to the question, "If the opportunity were offered, would you like to talk over any of these problems with someone on the college staff?"[8] At the high-school level, the percent is seventy-eight on a similar question.[8] Results at the junior-high-school level are not yet available.[7] There is little indication that students try to hide their problems or to "play" with the check lists. They are surprisingly serious and constructively interested, exposing far more problems than had originally been anticipated.

[2] Based on 209 cases using the current edition and 985 students using previous experimental editions. Averages vary for different groups above and below the general mean of thirty.

[3] Based on 1028 cases using the current edition. Averages vary for different groups above and below the general mean of twenty-seven.

[4] Estimated on the basis of 684 cases using a previous experimental edition.

[5] Based on 329 cases.

[6] Ninety-five per cent on the basis of 1028 cases.

[7] Previous experimental editions did not carry this question.

[8] Based on 209 cases.

The check lists may be used by a variety of persons for a variety of purposes. They may be employed by counselors in guidance interviews to aid the student in getting a perspective on his problems and to aid the counselor in securing quickly a picture of problems which are the expressed concern of the student. When given to groups of students, the check lists can easily be sorted and summarized to aid: (a) counselors in discovering those students who most want and need counsel, (b) personnel administrators in planning and operating a coordinated guidance program, (c) curricular committees in getting leads to needed revisions in the curriculum, (d) committees on extracurricular activities in locating students who most desire the kind of help which such activities can give, (e) home-room, group-guidance, and orientation teachers in discovering the kinds of activities which would be most pertinent for their particular groups of students, (f) regular classroom teachers in individualizing and personalizing their instruction, (g) administrators in discovering the extent of student dissatisfaction with various elements in the school program and in tracing down the sources of dissatisfaction, and (h) research workers in discovering patterns of problems which tend to be associated with given problems or particular factors.

Procedures for using the check lists in these suggested ways are outlined in considerable detail in the manuals to accompany the forms.[9] Particular consideration is given in the remainder of this article to the last suggested use, i.e., to aid research workers in discovering patterns of problems which tend to be associated with given problems or particular factors. Such research can be of general significance in getting a better understanding of the place and functioning of problems in human behavior. Most of our knowledge, to date, on the evolution and interrelationships of problems has been based upon case study which does not lend itself easily to comparison of results among numbers of individuals and numbers of groups. The check lists now

[9] Ross L. Mooney, *Manual to Accompany the Problem Check List, College Form.* (Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1942). Pp. iv–101, mimeographed.

Ross L. Mooney, *Manual to Accompany the Problem Check List, High School Form.* (Columbus, Ohio: Bureau of Educational Research, Ohio State University, 1943). Pp. vi–95, mimeographed.

A manual to accompany the junior-high-school form will be issued when sufficient data are available on the recently printed edition. Meanwhile use is made of mimeographed reports on results from 684 cases using a previous edition.

afford a technique for comparison of individuals and groups on a wide scale, and thereby re-open some old questions for fresh study and introduce some new questions which have not heretofore been considered feasible for study because of the lack of systematic techniques.

Suggested below are some of the longer-range questions on which the check list may be able to throw some significant light:

1. How do problems progress and change with age and maturity? Do changes progress evenly on the basis of chronological age, or are the developmental patterns to be better understood in terms of other criteria?

2. What differences are there in the problems of boys and girls? Are the differences sufficient to justify special provisions in the curriculum at certain class levels to take sex differences into account?

3. Do students with high intelligence ratings show more problems (because they are bright enough to see them!) or fewer problems (because they are bright enough to solve them!)? Is the pattern of problems of the more intelligent students different in kind from that recognized and expressed by students of lower intelligence? If so, are these differences sufficiently clear to justify particular programs for superior students? What problems are distinctive for retarded students? In what ways does academic retardation raise problems for retarded students in other areas of their experience?

4. How do accelerated programs affect the personal lives of students? Do students who are pushed ahead of their years or ahead of their normal schedule of work pay for acceleration in added problems? Or does the stimulation of acceleration serve to reduce the number and critical quality of the problems expressed by the students? What is the situation after six months of acceleration? After a year?

5. How is the war reflected in the personal lives of the students? Are sex problems accentuated? Moral problems? Home problems? Vocational problems? Race problems? School-work problems?

6. In what ways do the problems of youth reflect the communities from which the students come? Does community environment make a difference? Is it safe to assume that the problems of students are so uniform in various communities that standard educational programs can be set up in all communities, or is it necessary that the programs differ by communities if

students' needs are to be taken into account? What sort of differences obtain? Are the problems of rural youth significantly different from the problems of urban youth? Are the problems of rural youth in the South significantly different from the problems of rural youth in New England? What problems are distinctive for youth from homes of low economic status? High economic status? Are economic criteria the most significant criteria for predicting the problems of youth?

7. What are the particular problems of minority groups? Do youth from homes of minority racial, religious, and nationality groups have problems which are just about the same as those of youth from other groups, or are their problems distinctive and especially acute?

8. What relation is there between interests and problems? Are students "interested" in the same things they are "concerned about?" Is it the students who show a marked interest in people who also show marked problems in getting along with people, or is it the students who are not interested in people who have problems in learning how to get along with people? Can one predict interests from problems or problems from interests? What differences would there be in a curriculum built upon "interests" and a curriculum built upon "problems"?

9. How do attitudes affect problems and problems affect attitudes? Do students who show conflicts and inconsistencies in their attitudes reveal a tendency to have an unusual number of problems? Will certain specific problems in the life of a student affect his attitudes on related issues, or is there a hiatus between the specific problems faced by the student and his generalized attitudes on related issues?

10. Do personalities show a tendency to classify themselves in terms of the types of problems with which they are concerned? If so, do these types follow any of the customary classifications or do they follow lines which are new and different?

11. What problems are the most critical? What problems should a counselor be most alert to discover when he has limited time to interview students? What would be the twenty-five most important problems for which to watch? When one of these problems is found in a case, what would be a half-dozen lines of inquiry to follow in the case in order to uncover other problems which are most likely to be related?

12. To what degree and in what manner are non-vocational problems related to the problem of deciding on an occupation? What other kinds of confusions tend to accompany indecision about a vocation? May vocational guidance be safely limited to a discussion about occupations, aptitudes, and skills, or must it move,, in the great majority of cases, into other lines of guidance in order to make a vocational decision substantial? Into what other areas of problems do vocational problems tend to extend in the majority of cases?

13. To what degree does the solution of problems in the production of school work depend upon the acquirement of study skills? Is the school "hitting the nail on the head" when it tries to improve scholastic work through trying to improve the skills of students in doing academic work, or must the school, in the great majority of cases, move into other areas of the life of the student in order to solve the fundamental difficulties which prevent good school work? With what sorts of problems are school difficulties usually associated?

14. What are the effects of broken homes on youth? Are the effects the same at the junior-high-school, high-school, and college levels? Are the problems which are created simply those of family relations, or do they extend quickly into sex, moral, religious, physical, vocational, and school-work areas? What has happened in the case of the exceptions?

This list is merely illustrative; it can be extended much further.

Thus far there has been opportunity only for some exploratory studies to try techniques on some of these problems. Differences by sex, class, age, and community; methods for identifying the most critical problems; and the patterns of problems for certain critical items ("Clarifying what I really want", "Speech defect", "Mother" and "Father", "Wondering if I'll find a suitable mate", and "Afraid to speak up in class discussions") are reported in the manuals to accompany the college form and the high-school form. These studies are not as yet based on large enough samplings to merit general conclusions, and thus are primarily illustrations of the techniques and the possibilities. The work has gone far enough, however, to promise some significant findings in the future.

The function of this article is to open this field to research workers who are interested in this area of investigation. Students' problems have

been recognized for some time as of vital importance to the design and conduct of personnel work and have been accepted as basic considerations in the construction of curricula. However, to date, surprisingly few instruments have been developed which will quickly and simply bring these problems into focus for students, counselors, teachers, and administrators. The check list is designed to help fill this need, and in performing this function it also provides opportunities for advanced and vital research on the development and functioning of problems in human behavior.

EDITORIAL

WANTED: GUESSERS

"Most of the important scientific discoveries are made by the guessers and not by the accumulators, by the men whose slogan is 'First get your working hypothesis' and not by the men whose slogan is 'First get your facts.'" This statement was made by Dr. Wilder D. Bancroft in a series of lectures on The Methods of Research given at Rice Institute in 1928. Through numerous illustrations, Professor Bancroft shows that our most significant research discoveries have been made by men who guessed at laws or hypotheses and then set to work rigidly to investigate them rather than by those men who thought that important findings could be made by gathering and analyzing a great amount of factual material. Both kinds of research people are needed, however.

It is the thesis here that education has overemphasized the importance of the "accumulator" and has very much underestimated the importance of the "guesser." Since Buckingham wrote his book on *Research for Teachers* there has been an increasing popularization of research. Standard tests have been more generally used; new tests have been constructed not only by the trained test-makers but by classroom teachers with little training; statistical methods, at least the formulas, have been used widely; and many supposedly scientific experiments have been conducted in the schools by the regular school staff. At the same time the results of research findings have been made more easily available and to some extent have been used to modify school practice. All of this activity has emphasized the technics of the accumulator. These technics have helped us to meet some of the problems of a rapidly increasing school population and of the demand for a better educational product.

The demand for an improved educational product to meet the challenge of rapidly changing social conditions and especially postwar problems is not only present today but is likely to increase. Can the accumulators meet this demand? They will be needed to assist with many of the problems but the

grand strategy of the next few years requires research workers with imagination and ideas—inventors.

Many professors of education in our universities, who have been responsible for training graduate students, have held as an ideal "First get your facts." By this is meant get data to deal with and then apply statistical methods to this data in the hope that findings of value will emerge. It is a contention here that a different approach is now timely and it is expressed by the words "First get your working hypothesis." This is a far more difficult approach and one which requires that whatever is observed, or found to be the result of research, be worked over in one's thinking and feeling and acting so that it is an indistinguishable part of one's person and not merely a datum to be recorded for future analysis. Even one observation thus treated may result in a hypothesis worthy of examination. The attitude of mind required is well expressed in the topic of a lecture which has recently been given by Dr. John C. Krantz, Jr., Professor of Pharmacology in the Medical School of the University of Maryland. His topic was "The Simplicity to Wonder."

One summer I made the acquaintance of a professor of botany who was directing the research of graduate students. I asked him what research technics and skills he thought essential for research in his field. He did not know what I was talking about and I had considerable difficulty trying to explain. He emphasized acquaintance with the research literature of botany and an analysis of those problems which were in need of further research. This probably gives a cue as to the kind of research needed to solve many of our educational problems. To put the matter simply, we need far more work in analyses of the problems which we are facing than so much work on the collection of data which, in some way we are not quite sure of, may have a bearing upon these problems. We need not only to analyze the problems but arrive at some hypothesis as to what the solution may be before we gather our data. Then we can gather that data which will put this hypothesis to a rigid test. I have observed, as probably the readers of this journal have observed, that many a student will start out with some vague conception of the problem he wants to work with but gets bogged down by his data. Had he worked out carefully a hypothesis first and then set to work to rigidly investigate it, there would not probably have been this scattering of effort.

All of this leads to our central question: How can we produce research workers of the type here envisaged? It certainly will not be by training

graduate students in technics, valuable as these are. It will not consist in an apprenticeship in preparing questionnaires and gathering masses of data, necessary as this may be at times. If the research worker is to become truly creative he must be led to examine critically traditional practices and their assumptions, be encouraged to observe the unusual and note undeveloped aspects of older studies. He must be kept from the discouragement of blind alleys and the confusion arising from letting his imagination lead him in many directions at the same time. To a certain extent this type of research worker is not produced but discovered. In his early career he may seem less efficient and scientific than those less gifted with imagination. He may irritate his professors by questioning the validity of time-honored practices.

The impact of the war and the social, technological and economic developments of recent years will surely bring profound changes in our way of living and pressures on education. Our basic educational problems will not be solved by the accumulators but by the guessers—men and women of ability and with imagination, hypotheses and inventions.

WARREN W. COXE.

Research Abstracts and Bibliographies

Address research bulletins and other communications to A. S. Barr, Department of Education, University of Wisconsin, Madison 6, Wisconsin.

BULLETINS

ANDERSON, G. LESTER. *Adapting the High School to Wartime and Post-war Needs.* The Modern School Curriculum Series, No. 1. Minneapolis, Minnesota: University of Minnesota Press, 1943, 53 pp.

One of a series of bulletins of curriculum revision discussing getting boys ready for the service; meeting wartime needs and rendering war services; developing an understanding of world affairs; and preparing students for the postwar world.

BOGARDUS, EMORY S. and WILLIAMS, CHESTER. *Democracy by Discussion.* Washington, D. C.: American Council on Public Affairs, 1942, 59 pp.

A report of the American Council on Public Affairs discussing the role of discussion in democracy and techniques for handling discussion groups.

BOOKWALTER, KARL W. *Further Studies of Indiana University Motor Fitness Index.* Bureau of Cooperative Research and Field Service, XIX, No. 5, Bloomington, Indiana: School of Education, Indiana University, 1943, 48 pp.

Discusses the validation of Indiana University motor fitness indices; and gives description of measures with norms.

BOYD, GEORGE ROBERT. *The Construction of an Instrument for Measuring Attitudes Toward Desirable Food Practices.* Bulletin of the Bureau of School Service, XVI, No. 1. Lexington, Kentucky: College of Education, University of Kentucky, 1943, 89 pp.

Discusses construction of the attitude questionnaire, construction of the free association test, with summary, conclusions, and recommendations.

BROWNELL, WILLIAM A. and CARPER, DORIS V. *Learning the Multiplication Combinations.* Research Studies in Education, No. 7. Durham, North Carolina: Duke University Press, 1943, 177 pp.

This monograph presents a summary of previous investigations, a report of two investigations, a critical review of the concept of readiness, and suggestions for teaching multiplication combinations.

CAMPBELL, A. E. *Higher Education and its Future.* Studies in Education, No. 8. Christchurch, New Zealand: Whitcombe & Tombs, Ltd., 1943, 44 pp.

A reprint of a paper to appear in the 1943 Yearbook of International Institute of Teachers College, Columbia University, discussing higher education in New Zealand.

DELANEY, ELEANOR C. *Latin America.* New York City: Bureau of Publications, Teachers College, Columbia University, 1943, 67 pp.

Discusses contributions of children to the good neighbor policy; interests and concerns of children which furnish leads to activity; suggested activities for children; materials for children; and background information for teachers.

DICE, LEAH KATHRYN. *An Experimental Study of Two Methods of Teaching Beginning Reading.* The Johns Hopkins University Studies in Education, No. 32. Baltimore, Maryland: The Johns Hopkins Press, 1942, 91 pp.

An experimental study of two methods of teaching reading in which the author found that the direct approach of reading meaningful materials was superior to the preparatory analytical method.

EDELSTON, H. *Separation Anxiety in Young Children: a study of Hospital Cases.* Genetic Psychology Monographs, Vol. 28, (first half). Provincetown, Massachusetts: The Journal Press, 1943, 93 pp.

Presents an analysis of case studies of the hospital experiences of children. The author believes that the child's need for security gives a better understanding of his problems than other explanations.

Education and the United Nations, A report of a joint commission of the Council for Education in World Citizenship and the London International Assembly. Washington, D. C.: American Council on Public Affairs, 1943, 112 pp.

Bulletin of the American Council on Public Affairs discussing destruction and reconstruction, re-education in enemy countries, education as a foundation for the post-war system, and summary of recommendations.

EMMETT, W. G. *An Inquiry into the Prediction of Secondary-School Success.* Bickley, Kent, England: University of London Press, Ltd., 1942, 58 pp.

A statistical study from which multiple coefficients of correlation of .74 and .76 were secured between achievement and intelligence, English and arithmetic.

EPLER, STEPHEN EDWARD. *Honorary Degrees.* Washington, D. C.: American Council on Public Affairs, 1943, 224 pp.

Discusses historical origins; opposition to the honorary Ph. D.; Influence of a busines era; national trends since 1929; vox populi; summary and recommendations. Bibliography.

Fourth Report of the Committee on School and College Relations of the Educational Records Bureau. New York City: Educational Records Bureau, 437 West 59th Street, 1943, 55 pp.

This report contains the recommendations made in 1942 by the committee of school and college representatives and the answers of the colleges of the United States to the communications sent to them.

GEYER, DON F. *A Study of the Administrative and Supervisory Duties of the Teaching Principal in the Small Elementary School.* Bulletin of Information, Vol. 22, No. 7. Emporia, Kansas: Kansas State Teachers College, 1942, 39 pp.

Presents a study of the administrative and supervising duties of elementary school principals in the State of Kansas.

GOOD, C. V. and others. "Methods of Research and Appraisal in Education," *Review of Educational Research*, XII, No. 5 (December, 1942), pp. 458-558.

Discusses such research and problems as bibliographical and documentary techniques in Education, Psychology and Social Science; analytic, synthetic, and diagnostic studies of individuals; evaluative studies; questionnaires, interviews, personality schedules; test development; tabulating and test-scoring machines; and reporting, summarizing, and implementing educational research.

HALBERT, MARIE GOODWIN. *An Experimental Study of Children's Understanding of Instructional Materials*. Bulletin of the Bureau of School Service, XV, No. 4. Lexington, Kentucky: College of Education, University of Kentucky, 1943, 69 pp.

An illustration of needed research relating to the preparation of instructional materials in the field of economic information.

JACKSON, SIDNEY L. *America's Struggle for Free Schools*. Washington, D. C.: American Council on Public Affairs, 1941, 276 pp.

The author reviews the struggle for free schools: ideas of the intellectural leadership; the ideas of the educators; the philosophy of organized education; the ideas of the rural publicists; and the labor and city protest movement. Bibliography.

KLIER, FRANK J. *Language Teaching in Wisconsin Public High Schools, 1941-1942*. Madison, Wisconsin: State Department of Public Instruction, 1943, 78 pp.

Discusses the attitudes of community-parents and pupils toward high-school language programs; the preparation of language teachers; language teachers at work; teaching load, tenure, and salaries; the typical language teacher in a Wisconsin public high school; an analysis of teacher objectives in language study; aids and methods in language teaching; and the importance of languages in war and in peace.

MADDY, NANCY RUTH. *Comparison of Children's Personalitly Traits, Attitudes, and Intelligence with Parental Occupation*. Genetic Psychology Monographs, Vol. 27, (first half). Province, Massachusetts: The Journal Press, 1943, 65 pp.

Report of a study of the relationship between socio-economic status and the intelligence and emotional make-up of children.

MORRISON, JOHN. *The Teaching of Arithmethic*. Publications of the Scottish Council for Research in Education, XXI. Bickley Kent, England: University of London Press, Ltd., 1943, 31 pp.

A summary of three previous investigations in this area prepared for teachers and field workers.

Motor Vehicle Traffic Accidents to Pedestrians in Pennsylvania, 1939 and 1940, with special reference to Children of School Age, Bulletin 75, No. 20. Philadelphia, Pennsylvania: Commonwealth of Pennsylvania, 1941. 26 pp.

Presents analysis of accidents to pedestrians including deaths and injuries; responsibility for accidents; the bicycle; motor vehicle fatalities in Pennsylvania, 1939–40; summary and conclusions.

NEWMAND, SAMUEL CLAYTON. *Employment Problems of College Students.* Washington, D. C.: American Council on Public Affairs, 1942, 158 pp.

A bulletin discussing unequal opportunity in higher education; conflicting philosophies; background and perspectives; extent and conditions of student employment; scholastic effects of student employment; personal and social effects of student employment; present programs and policies; and conclusions and recommendations. References.

ORLEANS, JACOB S. and SAXE, EMANUEL. *An Analysis of the Arithmetic Knowledge of High School Pupils.* City College Research Studies in Education, No. 2. New York City: The College of City of New York, School of Education, 1943, 144 pp.

A report upon the arithmetical achievement of some two thousand New York City high school pupils.

PIGNATELLI, MYRTLE LUNEAU. *A Comparative Study of Mental Functioning Patterns of Problem and Non-Problem Children Seven, Eight, and Nine Years of Age.* Genetic Psychology Monographs, Vol. 27 (second half). Provincetown, Massachusetts: The Journal Press, 1943, 91 pp.

The study attempts to determine (a) whether problem and non-problem children seven, eight, and nine years of age differ significantly in their mental functioning patterns on the Stanford-Binet; (b) whether children seven, eight, and nine years of age who show extremely grave behavior manifestations and children who show behavior manifestations of little consequence, differ significantly in their mental functioning patterns on the Stanford Binet.

PITLUGA, GEORGE E. *Science Excursions into the Community.* New York City: Bureau of Publications, Teachers College, Columbia University, 1934, 154 pp.

Discusses the excursion as a teaching technique, planning the excursion program, maintaining health and safety, participation in home life, using and controlling the natural environment for human needs, communicating with others and transporting goods and people, understanding the world and the universe, and some suggested experiments.

Pre-induction Training in Vocational Schools, Vocational Departments, and Trade Schools. Prepared jointly by War Department and U. S. Office of Education. Washington, D. C.: United States Government Printing Office, 1943, 29 pp.

Presents an overview of pre-induction training needs; army manpower needs and shortages of trained specialists; the role of vocational schools, vocational departments, and trade schools in pre-induction training; and suggestions for the instructional program in vocational schools, vocational schools, vocational departments, and trade schools.

Proceedings of the Eighth Annual Guidance Conference Held at Purdue University. Studies in Higher Education, XLVII. Lafayette, Indiana: Division of Educational Reference, Purdue University, 1942, 98 pp.

Papers read at the eighth annual guidance conference held at Purdue University, November 13 and 14, 1942.

ROE, ANNE. *A Survey of Alcohol Education in Elementary and High Schools in the United States*. New Haven, Connecticut: Printing Office, Yale University Press, 1943, 132 pp.

Presents a survey of teaching practices and materials, and legal regulations relating to alcohol education.

SANFORD, R. NEVITT, and others. *Physique, Personality and Scholarship*. Monographs of the Society for Research in Child Development, VIII, No. 1. Washington, D. C.: Society for Research in Child Development, National Research Council, 1943, 705 pp.

A comparative study of school children discussing inter-relations between diet, illness and certain physical variables; physical measurements; physiological variables; intercorrelation of physical and physiological syndromes; the variables of personality and of the environment; intellectual development and school abilities; relationships involving particular groups of syndromes; correlates; factors related to school success; and some general developmental trends. Bibliography.

SMITH, HENRY LESTER and EATON, MERRILL THOMAS. *An Analysis of Arithmetic Textbooks* (Fourth Period—1881 to 1910). XIX, No. 4. Bloomington, Indiana: Bureau of Cooperative Research and Field Service, School of Education, Indiana University, 1943, 62 pp.

An analysis of arithmetic textbooks (1881–1910): space given to various topics; use made of drill, objects, pictures, and problems; and related topics.

TSCHECHTELIN, SISTER M. AMATORA. *An Investigation of Some Elements of Teachers' and Pupils' Personalities*. Studies in Higher Education XLVIII, Further Studies in Attitudes, Series VI. Lafayette, Indiana: Purdue University, Division of Educational Reference, 1943, 89 pp.

A study of the personalities of elementary school pupils and teachers.

Twenty-Ninth Annual Conference on Educational Measurements; and a Study of the Achievement of Freshman Students Holding County Scholarships. XVIII, No. 5. Bloomington, Indiana: Bureau of Cooperative Research and Field Service, School of Education, Indiana University, 1942, 57 pp.

Summarizes three papers: Fact and Fancy in Educational Measurements; Next Steps in Educational Measurements; and A Study of the Achievement of Freshman Students Holding County Scholarships.

War Jobs for Women. Washington, D. C.: Office of War Information, Magazine Section, 1942, 48 pp.

War jobs for women in war industries, in business, and in the professions.

WOODY, CLIFFORD and GATIEN, RAOUL. *The Sophomore and Freshman Testing Program in the Accredited High Schools of Michigan, 1942*. Bureau of Educational Reference and Research Bulletin, No. 155. Ann Arbor, Michigan, 1943, 197 pp.

Presents data on the achievement of Michigan freshmen and sophomores on mental tests and on test for the interpretation of social data; vocational interests, satisfaction status and adjustment status of the pupils, and characteristics of behavior scores.

Research News and Communications

Address all research news and communications to Carter V. Good, Teachers College, University of Cincinnati, Cincinnati, Ohio.

N. E. A. Research.—The N. E. A. Research Division has been organized for twenty-one years. During that period it has answered more than a hundred thousand individual letters of inquiry, prepared more than a hundred *Research Bulletins*, edited forty-two yearbooks for departments, tabulated eleven nationwide surveys of salaries in city school systems, and compiled hundreds of bibliographies and memorandums on educational problems.

Yearbooks.—Now reaching final stages of editing is the 1944 yearbook of the American Association of School Administrators. The topic, *Morale for a Free World*, is really a broader treatment of social and individual psychology than the word, morale, ordinarily implies. The 1945 yearbook dealing with "lessons of the past decade" has been outlined. It will attempt to state briefly some of the next steps in governmental relationships, finance, community relations, personnel, and curriculum development.

The 1944 yearbook of the Department of Elementary School Principals on creative experiences will be issued in the summer of 1944. The 1943 volume recently issued, entitled *Elementary Schools —the Frontline of Democracy*, dealt with the building of citizenship.

Discussion Outlines.—In an attempt to bridge the gap between published research studies and the thinking of the profession, the Research Division has prepared a series of discussion outlines. These are being used by the Department of Classroom Teachers, N.E.A., in a nationwide program of group discussion.

Research Bulletins.—The October *Research Bulletin* presents theory and practices with respect to the slow-learning secondary school pupil. It is similar in organization to an earlier bulletin on the superior child. The December bulletin will summarize certain economic trends as related to teachers' salaries.

Other topics under study for later publication include: (1) camping programs in city-school systems; (2) supervision in city schools; (3) the effect of the war on teachers colleges; (4) state school finance legislation, 1939–1942; and (5) teachers' attitudes toward administrative and personnel procedures.

Committees.—The Division is completing an index of tenure cases and a summary of local military leave procedures for the Committee on Tenure. Preliminary steps have been taken on the 1943 summary of court cases in the field of teacher tenure.

A revised summary of local and state teacher retirement laws is approaching final manuscript form for the National Council on Teacher Retirement.

Other studies are being discussed in the fields of public finance, international re-

lations, safety education, and teacher preparation.

Federal Aid.—The Division has compiled and will continue to prepare data on teacher shortage, finance, salaries, and other matters related to the program for obtaining federal aid.

Memorandums.—To keep professional leaders abreast of current developments, the Division issues mimeographed releases from time to time in such areas as: social security, manpower, income taxes, economic trends, and other federal legislative events.

This progress report was prepared by the director of research, Frank W. Hubbard.

Commission on Teacher Education.—The Council on Cooperation in Teacher Education held its first long working conference, August 17–28, 1943, at the University of Wisconsin in Madison. A total of fifty-four men and women were in attendance, most of them for the full two weeks, representing all but one of the fifteen national organizations that comprise the Council. The objects of the conference were: (1) to provide a setting against which the several organizations could evaluate their programs as they relate to teacher education and plan both individual and cooperative projects for the future, and (2) to discover ways in which individuals in different positions and types of institution could support each other in improving teacher education.

During the first week, the delegates met every morning in five discussion groups to consider the following topics: (1) developing the teacher as a person, under the leadership of Paul V. Sangren, president of Western Michigan College of Education, Kalamazoo; (2) developing the teacher as a professional worker: (a) through the understanding of children and youth, led by Jean Betzner, associate professor of education at Teachers College, Columbia University; (b) through an understanding of society, led by W. Earl Armstrong, field coordinator for the Commission on Teacher Education; (c) through specialized competencies, led by Karl W. Bigelow, director of the Commission; and (d) through participation in educational planning and program development by group action, under the leadership of Charles E. Prall, field coordinator for the Commission. The evenings were given to presentation of the program and publications of the Commission on Teacher Education; virtually all members of the staff were in attendance for consultation.

During the second week, the several delegates met by organizations to consider the implications for their own programs of the first week's discussions. Mimeographed reports from the five groups were available for this purpose. At the closing general sessions each organization reported on the recommendations the appropriate delegates had drawn up for presentation to their executive committee. These recommendations included proposals for a wide range of individual studies and cooperative activities to be carried out with one or more national organizations (including several not represented at the conference), and also plans for using and reviewing the publications of the Commission on Teacher Education as they appear.

The fifteen organizations that make up the Council on Cooperation in Teacher Education are as follows: American Association of School Administrators, American Association of Teachers Colleges, As-

sociation for Childhood Education, Commission on Teacher Education, Department of Classroom Teachers of the N.E.A., Department of Supervision and Curriculum Development of the N.E.A., National Association of Colleges and Departments of Education, National Association of Secondary School Principals, National Association of State Directors of Teacher Education and Certification, National Association of Supervisors of Student Teaching, National Association of Teacher Education Institutions in Metropolitan Districts, National Institutional Teacher Placement Association, National League of Teachers' Associations, National Society of College Teachers of Education, and the Teachers College Personnel Association.

Committee on Modern Languages.—During the year ending September 30, 1943, this Committee of the American Council on Education has continued its activities: work of research and experiment in foreign language teaching, including the teaching of English to peoples of foreign speech. The battery of Inter-American tests, created by H. T. Manuel and assistants at the University of Texas, was brought to completion in October, 1942. The series, which is parallel throughout in English and Spanish, includes general ability, vocabulary, reading for comprehension, language usage, and vocabularies in natural science and social science. These have now been administered in two monolingual areas, Texas and Mexico, and in an area of bilingual instruction, Puerto Rico, under contract with the Coördinator of Inter-American affairs.

The administration took place in selected public schools in Texas, in Saltillo and Monterrey, and, less extensively, in Mexico City. Full coöperation was given by the Mexican Department of Education. The administration in Puerto Rico included 20,000 pupils, representing all types of schools, and all age-groups and levels of instruction from the first grade to college freshmen. The scoring of the more than 100,000 answer sheets has been done in San Juan, where tabulation is now under way. The results of the three administrations will be studied in Austin and interpreted for comparable data. A final report is due February 1, 1944; and it is expected that the tests can then be published and made generally available with apparatus for administration in any area where English is taught to Spanish-speaking students.

Contemporaneously with the testing project in Puerto Rico, H. T. Manuel and the Chairman of the Committee, assisted by Sayre P. Maddock, formerly vice-principal of Ward College in Buenos Ayres, and others, undertook a study of the organization, materials, and methods of English teaching in Puerto Rico, along with teacher training and experience and public use of English in the island. All the Committee's projects have enjoyed the active assistance of the Commissioner and members of the Puerto Rican Department of Education and the University at Rio Piedras, as well as that of the Asociación de Maestros of the island.

The Committee has in print a *French Syntax List*, prepared by Richard Clark, U. S. N. R., and L. S. Poston, Jr., of Knox College, which should be ready for distribution (New York: Henry Holt and Co.) in November, 1943. The work, approximately 290 pp., is based on a frequency count and follows closely the tech-

niques used in Keniston's *Spanish Syntax List*, published by this Committee in 1937 (Holt and Co.). A *German Syntax List*, similarly organized, is still under preparation.

Material for a third volume of the *Analytical Bibliography of Modern Language Teaching*, covering 1937–42, has been assembled. Publication, which has been delayed by the war, will take place in the coming winter.

The Committee consists of the following: Robert Herndon Fife, chairman, who prepared this statement; Charles C. Fries; Isaac L. Kandel; Hayward Keniston; H. T. Manuel; James B. Tharp; and George F. Zook.

John Dewey Society.—The sixth yearbook of the John Dewey Society has appeared under the title of *Mobilizing Educational Resources for Winning the War and the Peace*, edited by Ernest O. Melby and published by Harper. The major conclusions and recommendations are as follows:

1. Winning the war and the peace is far more than a military matter; among other things, it involves national and international problems of education.

2. The first step in the solution of these problems is the recognition of the crucial role of the teaching profession; the situation calls for an all-embracing teachers' organization of national scope, built upon existing organizations.

3. The teaching profession should provide leadership in the development of a national educational program, but the power of decision should rest with the total American community.

4. A national emergency educational board is proposed, to deal with the educational problem on a national scale.

5. Following the war, an emergency international educational board should be created, to give attention to problems of world citizenship, the psychological condition of the vanquished peoples, improvement of education in the underprivileged countries, promotion of cultural exchange, and continuous scrutiny of educational programs in order to expose misuse of the schools for propagating ideas of national aggression.

General Education Board, 1942.—Appropriations by the General Education Board during the year, 1942, totaled $2,236,172. Of this sum $1,109,400 was taken from the principal fund and $1,126,772 from income. As of December 31, 1942, the unappropriated assets of the General Education Board, in terms of market value, amounted to $14,709,987. Total appropriations from 1902, when the Board was founded, to December 31, 1942, have been as follows:

From principal	$153,944,640
From income	121,291,335
	$275,235,975

The activities of the Board during the past year have been concerned with: development of economic and social resources, strengthening the natural sciences to meet southern needs, health services and nutrition, general college and university programs, public education, Negro education, summer-school projects, grants-in-aid, and fellowships.

Rockefeller Foundation, 1942.—In 1942 the appropriations of the Rockefeller Foundation amounted to $8,227,867 distributed for the most part in six major fields, roughly as follows:

Public health	$2,700,000
Medical sciences	1,434,000
Natural sciences	815,000
Social sciences	1,326,000
Humanities	982,000
Program in China	122,000

Of the money appropriated during the year, 67 per cent was for work in the United States and 33 per cent for the program in other countries. The amount spent in foreign countries was larger than in any year since 1937, and represents an increase of 30 per cent over the average of the years, 1938 to 1941. This increase is due to two causes: first, the developing program of the Foundation in Latin America, and second, the growing needs of the Foundation's Health Commission in connection with war activities abroad.

Chicago Fellowships.—Up to thirty Encyclopaedia Britannica fellowships at the University of Chicago will be awarded in a total of twenty-one fields, some of which may require more than one fellow. Among the most liberal fellowships available to the University, the grants will range from $1,000 to $2,000, averaging $1,500, according to the qualifications of the candidates and in part on the amount of service to be given by the fellow. The Britannica fellows will be expected to contribute approximately one-third of their time in assisting the University faculty committees in providing editorial advice and consultation in the continuous annual revision of the Encyclopaedia Britannica. The fields in which fellowships have been established are: anthropology, archaeology, art, astronomy, biology, chemistry, economics, education, geography, geology, history, home economics, law, literature, mathematics, medicine, philology, philosophy, physics, psychology, and religion. The Encyclopaedia is now the property of the University of Chicago.

New Zealand Research.—The eighth annual report of the New Zealand Council for Educational Research states that the Council has now received the last installment of a ten-year grant from the Carnegie Corporation of New York. The Council must now consider its financial position, and policies and plans for the future.

The work has been carried forward under increasing difficulties during the third year of war, but steady progress has been made. Among the publications issued during 1942 are: McQueen's *Education in New Zealand Museums* and Mathew's *The Institutional Care of Dependent Children in New Zealand.*

Social Studies in Wartime.—After issuing its widely publicized statement, *The Social Studies Mobilize for Victory*, the National Council for the Social Studies asked a committee of teachers, headed by Howard E. Wilson, to prepare an extensive report on what schools are doing, and can do, to adjust their social studies courses to war needs along the lines recommended in the original statement. The report, replete with illustrative curriculum revisions and practical teaching suggestions, has been scheduled for October, 1943, in two parts: *Wartime Social Studies in the Elementary School*, by W. Linwood Chase, and *Wartime Social Studies in the Secondary School*, by Erling M. Hunt. Each volume has 64 pages and sells for $1.00.

Social Studies Resource Units.—The remarkable success of the 1942 experiment of two N.E.A. departments in preparing

resource-unit material in pamphlet form for social-studies teachers has resulted in the announcement that five additional units have recently come off the press and that at least four more are scheduled for the fall of 1943. Each unit contains a 15,000-word analysis of a single social problem, followed by specific suggestions on how to teach that problem to secondary-school youth. The series is called "Problems in American Life," and the sponsoring organizations are the National Council for the Social Studies and the National Association of Secondary School-Principals. Titles of the five units recently published are:

War: The Causes, Effects, and Control of International Violence, by Carl Friedrich and Ronald B. Edgerton.

Making Our Government Efficient: Public Administration in the United States, by L. D. White, M. L. Goldschmidt, D. M. Castleberry, and E. R. Carr.

Population: Problems and Trends of Our Changing Population, by Frank Lorimer, Frederick Osborn, and Kenneth J. Rehage.

Public Opinion in War and Peace: How Americans Make Up Their Minds, by Harold D. Lasswell and Howard Cummings.

International Organization After the War: Roads to World Security, by Max Lerner, Edna Lerner, and Herbert J. Abraham.

Among the additional units that will soon be ready are: *America's Schools,* by John Dale Russell and T. Eldon Jackson; *Urban and Rural Living,* by Louis Wirth and Ray Lussenhop; *Politics in Action,* by A. N. Holcombe and James E. Downes; and *The Health of a Nation,* by Michael Davis and Lavone A. Hanna.

By virtue of a subsidy from the General Education Board for the production of these units, the professional organizations which are publishing them announce that the units may be purchased by teachers at less than cost. The price of a single copy is 30 cents, and any four copies may be had for $1.00, from the National Association of Secondary-School Principals or the National Council for the Social Studies, Washington.

American History.—The status of American history as a part of the curriculum for Grades I–XIV has been investigated by a committee of school teachers and college professors, headed by Edgar B. Wesley of the University of Minnesota. The committee has studied existing curriculums, methods, and textbooks used in teaching American history; and has made an extensive testing survey of youth and adult knowledge of American history. The results of the investigation, together with specific recommendations for the improvement of instruction in American history, have been scheduled for announcement in October, 1943. The project is financed in part by the Rockfeller Foundation and is under the joint sponsorship of the National Council for the Social Studies, the American Historical Association, and the Mississippi Valley Historical Association.

Library Terms.—The A.L.A. Glossary of Library Terms is now in print. After considerable preliminary work had been done, volunteer readers continued the work of gathering terms and definitions; 250 librarians from British Columbia to Florida read a great number of volumes during

the period from 1934 to 1936. In January, 1937, the Carnegie Corporation of New York provided a grant of funds for the preparation of the glossary. The glossary has been an outstanding example of a cooperative enterprise. The Bibliographic Society of America, the Catalog Code Revision Committee, and similar bodies have contributed definitions in the field of archives, bibliography, printing and publishing, paper, binding, illustrating, prints, music and map cataloging, microphotography, work with the blind, and other special fields of interest, encompassing the whole realm of books and the history of book-making.

Safety Education.—The American Association of Teachers Colleges, in conjunction with the National Safety Council, has recognized that safety education must be increasingly emphasized during the war. The two organizations have pooled their resources in a study to discover what teachers colleges should do to prepare teachers for responsibility in safety education.

Fifty member colleges of the Association in twenty-eight states agreed to help in the preparation of a questionnaire to be used in determining the status of safety education in the member colleges. Each college received a two-day visit from one of four specialists of the staff of the school and college division of the National Safety Council. The activities at the colleges differed. At some institutions the entire faculty met to discuss the problem: "What questions should be asked in order to secure a valid picture of your activities in safety education?" In others, individual conferences were held with key faculty members. The specialists also furnished various types of services to the colleges, such as talking with individual classes, holding individual conferences with students on particular problems, meeting assemblies and chapel groups, and other similar activities. The questionnaire is at present being revised in the light of the summer experience on the fifty campuses. When completed, it will be circulated to the entire membership of the Association. A report of the status of safety education, based on this questionnaire, should be ready in early spring, 1944.

Adult Extension Teaching.—A variety of adult teaching methods are used by the Extension Service of the State Land Grant Colleges and U. S. Department of Agriculture to bring their messages to rural families. The news article is one of these methods widely used. County agents and home demonstration agents have columns in local papers and provide timely information in other parts of the newspaper. The curtailment of gasoline has increased the importance of the newspaper as a method of extension teaching. To what extent do families read these news articles and act upon the information presented? Are they interested in reading the news articles?

To check on these questions a study was made by the New Jersey Extension Service of the reactions of homemakers to two news articles on nutrition. These news articles appeared over the name of the county home demonstration agent in local newspapers in five counties scattered over the state. One article was on the use of liver in the diet. It explained the nutritional value of liver, that low-priced liver was as nutritional as high priced liver, and how to cook liver to

preserve its vitamin content. It included three recipes for preparing liver. The other article gave a low-cost menu plan for a week. It included two recipes.

In a home-to-home canvas of typical areas, three weeks later, 223 homemakers were interviewed. Fifty-one percent of the homemakers who received the newspaper carrying the article on the use of liver read the article; 35 percent enjoyed it and 17 percent changed one or more practices suggested in the article. Sixty-one percent of the homemakers who received the newspaper carrying the low-cost menu article read it; 46 percent liked reading it and 27 percent used the low-cost menu as a guide in planning their meals. It was also found that the younger homemakers were more apt to try the suggestions in the article than the older homemakers. The report appears under the following title: Mildred B. Murphey, Fred Frutchey and Gladys Gallup, *Effectiveness of Nutrition News Article in Extension Teaching — New Jersey, 1942*, New Brunswick, N. J.: Rutgers University, 1942. (Agricultural Extension Service).